WEIL-McLAIN

SGO SERIES 3 OIL-FIRED NATURAL DRAFT STEAM BOILER



This Manual Includes:

Installation

Start-Up

Boiler Parts

Installer:
- Make sure this is the correct manual for the boiler. Verify boiler model on rating label.
- Leave all documentation received with boiler and burner with unit for future reference.

User: Boiler and burner must be installed and serviced by qualified service technician.

Part No. 550-141-829/1201

Read This Page First

Hazard Definitions

The following terms are used to bring attention to the presence of hazards of various risk levels or to important information concerning product life.

DANGER Indicates presence of hazards that will cause severe personal injury, death or substantial property damage if ignored.

WARNING Indicates presence of hazards that can cause severe personal injury, death or substantial property damage if ignored.

CAUTION Indicates presence of hazards that will or can cause minor personal injury or property damage if ignored.

NOTICE Indicates special instructions on installation, operation, or maintenance that are important but not related to personal injury hazards.

Symbol Definitions

The following symbols are used to indicate sequence of installation for:

P Factory-assembled packaged boiler—block, jacket and controls. Sizes 3 through 6 only.

A Factory-assembled block, no burner. Sizes 3 through 6 with jacket installed; steam trim controls shipped separately. Sizes 7 through 9 with jacket and steam trim controls shipped separately.

When Calling or Writing About the Boiler

Please have boiler model number and series from boiler rating label and CP number(s) from boiler jacket, burner and controls. On page 26 of this manual is space to list CP number(s).

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⚠WARNING Read all instructions before installing. Failure to follow all instructions in proper order can cause severe personal injury, death or substantial property damage.

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Installations must comply with:

- U.S.
  — State and local plumbing, heating and electrical codes.
  — National codes where applicable.
- Canada
  — Canadian Standards Association, CSA B139, Installation Code for Oil-Burning Equipment.
  — CSA C22.1 Canadian Electrical Code Part One.
  — Applicable local or provincial codes.

Before selecting boiler location:

- Check for nearby connections to:
  — System water piping.
  — Chimney. See pages 12-13. Boiler can be top or back vented.
  — Combustion and ventilation air supply. See page 5.
  — Oil supply. See page 24 for oil line routing.
  — Electrical power.
- Check area around boiler. Remove any combustible materials, gasoline and other flammable liquids.

⚠WARNING Failure to keep boiler area clear and free of combustible materials, gasoline and other flammable liquids and vapors can result in severe personal injury, death or substantial property damage.

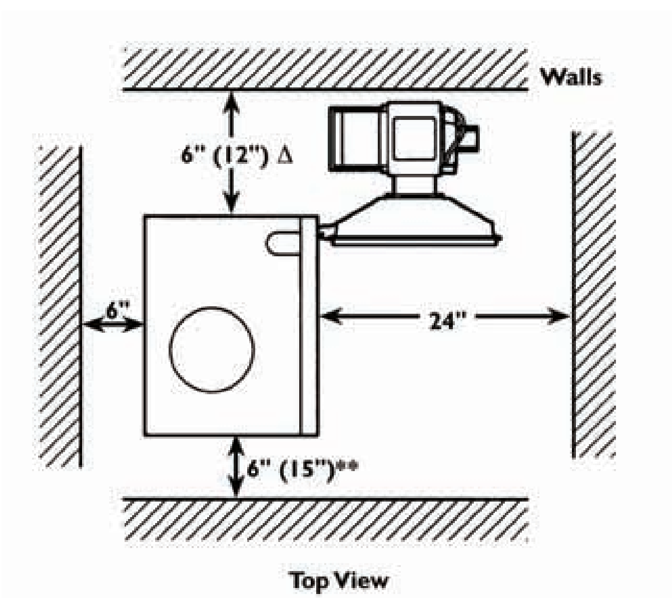
Provide clearances around boiler (see FIGURE 1):

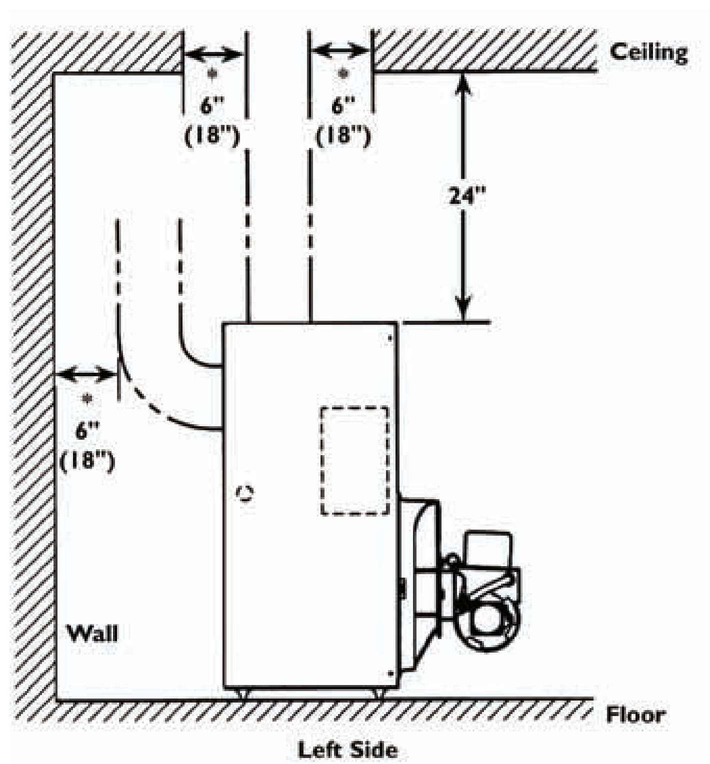
NOTICE Jacket cap must be in place on boiler to avoid requiring an 18" minimum clearance from back or top of boiler to combustible material.

- **Minimum** clearances from vent pipe to combustible material:
  6 inches — Type "L" doublewall vent*
  18 inches — Singlewall vent*

NOTICE Flue pipe clearances must take precedence over jacket clearances.

- Recommended **service** clearances:
  24 inches — Front and top
  6 inches — Left side**, back and right side Δ
  15 inches — Left side with tankless heater**
  12 inches — Right side for burner door swing radius Δ





Recommended Service Clearances
FIGURE 1

Provide air for combustion and ventilation:

⚠WARNING Adequate combustion and ventilation air:

- Assures proper combustion.
- Reduces risk of severe personal injury or death from possible flue gas leakage and carbon monoxide emissions.

Do not install exhaust fan in boiler room.

Older buildings with single-pane windows, minimal weather-stripping and no vapor barrier often provide enough natural infiltration and ventilation without dedicated openings.

New construction or remodeled buildings are most often built tighter. Windows and doors are weather-stripped, vapor barriers are used and openings in walls are caulked. As a result, such tight construction is unlikely to allow proper natural air infiltration and ventilation.

Follow state, provincial or local codes when sizing adequate combustion and ventilation air openings. In absence of codes, use the following guidelines when boiler is in a confined room *(defined by NFPA 31 as **less** than 7200 cubic feet per 1 GPH input of all appliances in area. A room 8 ft. high x 33.5 ft. x 33.5 ft. is 7200 cu. ft.):*

Provide two permanent openings — one within 12 inches of ceiling, one within 12 inches of floor. Minimum height **or** length dimension of each rectangular opening should be at least 3 inches.

When inside air is used — each opening must freely connect with areas having adequate infiltration from outside. Each opening should be at least 140 sq. in. per 1 GPH input (1 sq. in. per 1000 Btu input) of **all** fuel-burning appliances plus requirements for any equipment that can pull air from room (including clothes dryer and fireplace).

When outside air is used — connect each opening directly or by ducts to the outdoors or to crawl or attic space that freely connects with outdoors. Size per below:

- Through outside wall or vertical ducts — at least 35 sq. in. per 1 GPH input (1 sq. in. per 4000 Btu input) of **all** fuel burning appliances plus requirements for any equipment that can pull air from room (including clothes dryer and fireplace).
- Through horizontal ducts — at least 70 sq. in. per 1 GPH boiler input (1 sq. in. per 2000 Btu input) of **all** fuel-burning appliances plus requirements for any equipment that can pull air from room (including clothes dryer and fireplace).
- Where ducts are used, they should have same cross-sectional area as free area of openings to which they connect. Compensate for louver, grille or screen blockage when calculating free air openings. Refer to their manufacturer's instructions for details. If unknown, use:
  - — Wood louvers, which provide 20-25% free air.
  - — Metal louvers or grilles, which provide 60-75% free air.

  Lock louvers in open position or interlock with equipment to prove open before boiler operation.

Lay a foundation, if needed:

Boiler may be installed on non-carpeted combustible flooring.

For residential garage installation, install boiler so burner is at least 18 inches above floor to avoid contact with gasoline fumes.

A level concrete or masonry foundation is required when:

- Floor could possibly become flooded.
- Non-level conditions exist.

Solid concrete blocks can be used to create a pad.

BOILER FOUNDATION SIZE TABLE

BOILER MODEL	LENGTH INCHES	WIDTH INCHES	MIN. HEIGHT INCHES
SGO-3	17	22	2
SGO-4	20	22	2
SGO-5	23	22	2
SGO-6	26	22	2
SGO-7	29	22	2
SGO-8	32	22	2
SGO-9	35	22	2

P — Go to page 6 to install boiler

A — Go to page 7 to install boiler

Place boiler:

1. Remove boiler from pallet.

NOTICE Do not drop boiler or bump jacket on floor or pallet. Damage to boiler can result.

CAUTION Smaller sized boilers may be top heavy. Use caution when handling to avoid minor personal injury or property damage.

2. Boiler is shipped for back flue outlet. To change to top flue outlet (see FIGURE 2):
   a. Remove jacket cap on top of boiler.
   b. **Loosen** two screws holding flue cap strap to collector hood. Remove strap and flue cap from opening. **Re-tighten** screws.
   c. Check rope placement inside flue cap.

      (Read WARNING under step #5 below).

   d. Loosen two screws on back flue outlet. Set flue cap on outlet. Install strap by engaging slots in screws. Tighten screws. Make sure cap is securely installed.
   e. Snap jacket cap in back outlet opening.

      NOTICE Jacket cap must be in place on boiler to avoid requiring an 18" minimum clearance from back of boiler to combustible material.

3. Check level. Shim legs, if needed.
4. Check for secure placement of insulation on target wall, chamber floor and burner door.
5. Visually check:
   a. Flue collector hood seal.
   b. Burner mounting door seal.

      WARNING Obtain gas-tight seal to prevent possible flue gas leakage and carbon monoxide emissions, which can lead to severe personal injury or death.

Tankless heater, if used:

1. Remove tankless heater knockout in left side of jacket panel and, for SGO-6 only, tankless heater control knockout.
2. Remove tankless heater cover plate and gasket.
3. Install new gasket and tankless heater over studs around opening. Secure with $^3/_8$" nuts.
4. Install tankless heater operating control where shown on page 18. If not furnished, use operating control with maximum 10°F differential.

Perform hydrostatic pressure test:

1. Remove steam pressure gauge furnished with boiler. Install water pressure gauge for test only. Be sure gauge can handle test pressure.
2. Install air vent in tapping on top of boiler.
3. Remove pressure control and low water cutoff. Plug tappings.
4. Plug supply and return tappings.
5. Drain valve is already factory-installed.
6. Fill boiler. Vent all air. Pressure test boiler at 45-55 psig.

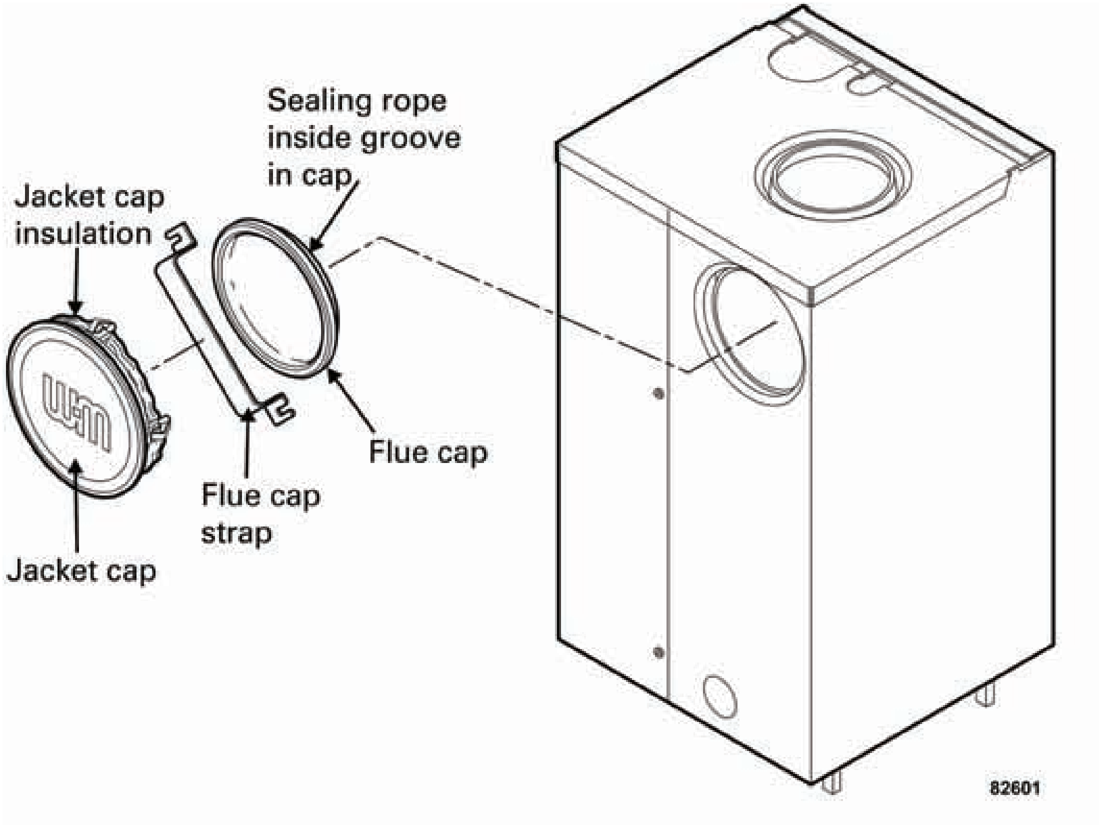
   WARNING Do not leave boiler unattended. Cold water fill can expand and damage cast iron, resulting in severe personal injury, death or substantial property damage.

7. Check for maintained gauge pressure for more than 10 minutes. Visually check for leaks if gauge pressure drops.
8. Drain boiler. Repair leaks if found.

   CAUTION Using petroleum-based compounds to repair leaks can damage system components, resulting in property damage.

9. Retest boiler after repairing leaks.
10. Remove pressure gauge, air vent and plugs. Re-install steam pressure gauge, pressure control and low water cutoff furnished with boiler.

Go to page 12 to connect breeching and venting



Change From Back Flue Outlet to Top Flue Outlet (Optional)
FIGURE 2

Install Non-Packaged Boiler

Fiberglass wool and ceramic fiber materials:

⚠WARNING

- POSSIBLE CANCER HAZARD BY INHALATION
- CAN CAUSE RESPIRATORY, SKIN AND EYE IRRITATION

This product contains fiberglass wool and ceramic fiber materials. Airborne fibers from these materials have been listed by the State of California as a possible cause of cancer through inhalation. Apply special care when handling ceramic fiber (chamber lining and base insulation) materials. Ceramic fibers can be converted to chrystobalites, a substance listed as a probable cause of cancer.

Suppliers of fiberglass wool products recommend the following precautions be taken when handling these materials:

Precautionary measures:

- Avoid breathing fiberglass dust and contact with skin and eyes.
- Use NIOSH approved dust/mist respirator.
- Wear long-sleeved, loose fitting clothing, gloves and eye protection.
- Wash work clothes separately from other clothing. Rinse washer thoroughly.
- Operations such as sawing, blowing, tearout and spraying may generate airborne fiber concentration requiring additional protection.

First aid measures:

- Eye contact — Flush eyes with water to remove dust. If symptoms persist, seek medical attention.
- Skin contact — Wash affected areas gently with soap and warm water after handling.

Place boiler:

1. **Non-Packaged SGO-3 through 6** — position on site.

CAUTION Smaller sized boilers may be top heavy. Use caution when handling to avoid minor personal injury or property damage.

   a. Boiler is shipped for back flue outlet. To change to top flue outlet (see FIGURE 3):
      1) **Loosen** two screws holding flue cap strap to collector hood. Remove strap and flue cap from opening. **Re-tighten** screws.
      2) Check rope placement inside flue cap.

      (Read **WARNING** under step #3 at right).

      3) Loosen two screws on back flue outlet. Set flue cap on outlet. Install strap by engaging slots in screws. Tighten screws. Make sure cap is securely installed.

2. **Non-Packaged SGO-7, 8 & 9** — split the assembled block for easier handling (see FIGURE 3):
   a. Open burner mounting door and using utility knife, slit floor insulation at joint to be separated.
   b. Remove 5½" draw rod and the longest draw rod from each side. Pull block apart. Save draw rods, nuts, washers and sealing rings for reassembly.
   c. Move divided block to location.
   d. Clean port openings with clean rag.

   CAUTION Do not use petroleum-based compounds to clean openings. Damage to system components can result causing property damage.

   e. Place rings in port openings. If ring slips out of groove, stretch ring gently for several seconds, then place in groove.
   f. Position sections so aligning lugs fit into sockets of next section. Make sure sealing rope is in good condition and in position.
   g. Oil threads on draw rods. Install washer and nut on end to be tightened. Use nut only on other end.
   h. With wrench at washer/nut end, uniformly tighten nuts starting with 5½" rod at large port, 5½" rod at small port, bottom long rod and finally top long rod.
   i. Torque on both 5½" rods and bottom long rod should be 50-60 ft. lbs; long top rod should be 20-25 ft. lbs. Do not back-off nuts.
   j. **Metal-to-metal contact should be made around port openings.** If gap does exist, it should be less than .020". Check with feeler gauge.
   k. If gap around port openings exceeds .020", check for dirt on port openings, sockets or misaligned lugs. If corrections are made and gap still exists, contact your Weil-McLain distributor or sales office before continuing installation.

3. **Non-Packaged SGO-7, 8 & 9** — install flue collector hood (see FIGURE 3):

WARNING Obtain gas-tight seal to prevent possible flue gas leakage and carbon monoxide emissions, leading to severe personal injury or death.

   a. Thread tinnerman clip on screw so that clip fits snugly in notch of hold-down lug. Screw must not turn.
   b. Remove paper on sealing rope. Starting at back section near flue collar, position sealing rope around top of block with adhesive side to sections. Do not stretch rope. Make sure rope ends meet. Trim excess rope.
   c. Position flue collector hood on top of boiler sections and over screws and clips as shown in FIGURE 3.
   d. Install washers and nuts. Tighten nuts until collector hood makes contact with tinnerman clip.
   e. **Back flue outlet boiler** — Position flue cap and strap over opening in flue collector hood. Make sure rope in cap is in place and in good condition. Tighten strap to hood with screws provided.
      Top flue outlet boiler — Position flue cap and strap over opening in back section. Make sure rope in cap is in place and in good condition. Tighten strap to boiler with screws provided in section. Install remaining screws in holes in flue collector hood.

4. Check level. Shim legs, if needed.

Tankless heater, if used:

1. SGO-3 through 6 — remove knockout in left side jacket panel, and for SGO-6 only, remove tankless heater control knockout.
2. Remove tankless heater cover plate and gasket.
3. Install new gasket and tankless heater over studs around opening. Secure with 3/8" nuts.

Perform hydrostatic pressure test:

1. Refer to FIGURE 4 and Control Tapping Table on page 10 to install:
   a. Boiler drain.
   b. Water pressure gauge (test only). Be sure gauge can handle test pressure.
   c. Air vent in tapping on top of boiler.
   d. Plugs in remaining tappings.
2. Fill boiler. Vent all air. Pressure test boiler at 45-55 psig.

⚠WARNING Do not leave boiler unattended. Cold water fill could expand and damage cast iron, resulting in severe personal injury, death or substantial property damage.

3. Check for maintained gauge pressure for more than 10 minutes. Visually check for leaks if gauge pressure drops.
4. Drain boiler. Repair leaks if found.

⚠CAUTION Do not use petroleum-based compounds to repair leaks. Damage to system components can result, causing property damage.

5. Re-test boiler after repairing leaks.
6. Remove pressure gauge, air vent and plugs from tappings used for controls.
7. Visually check:
   a. Sealing rope placement
   b. Metal-to-metal contact around port openings.
   c. Flue collector hood seal.
   d. Burner mounting door seal.

⚠WARNING Obtain gas-tight seal to prevent possible flue gas leakage and carbon monoxide emissions, which can lead to severe personal injury or death.

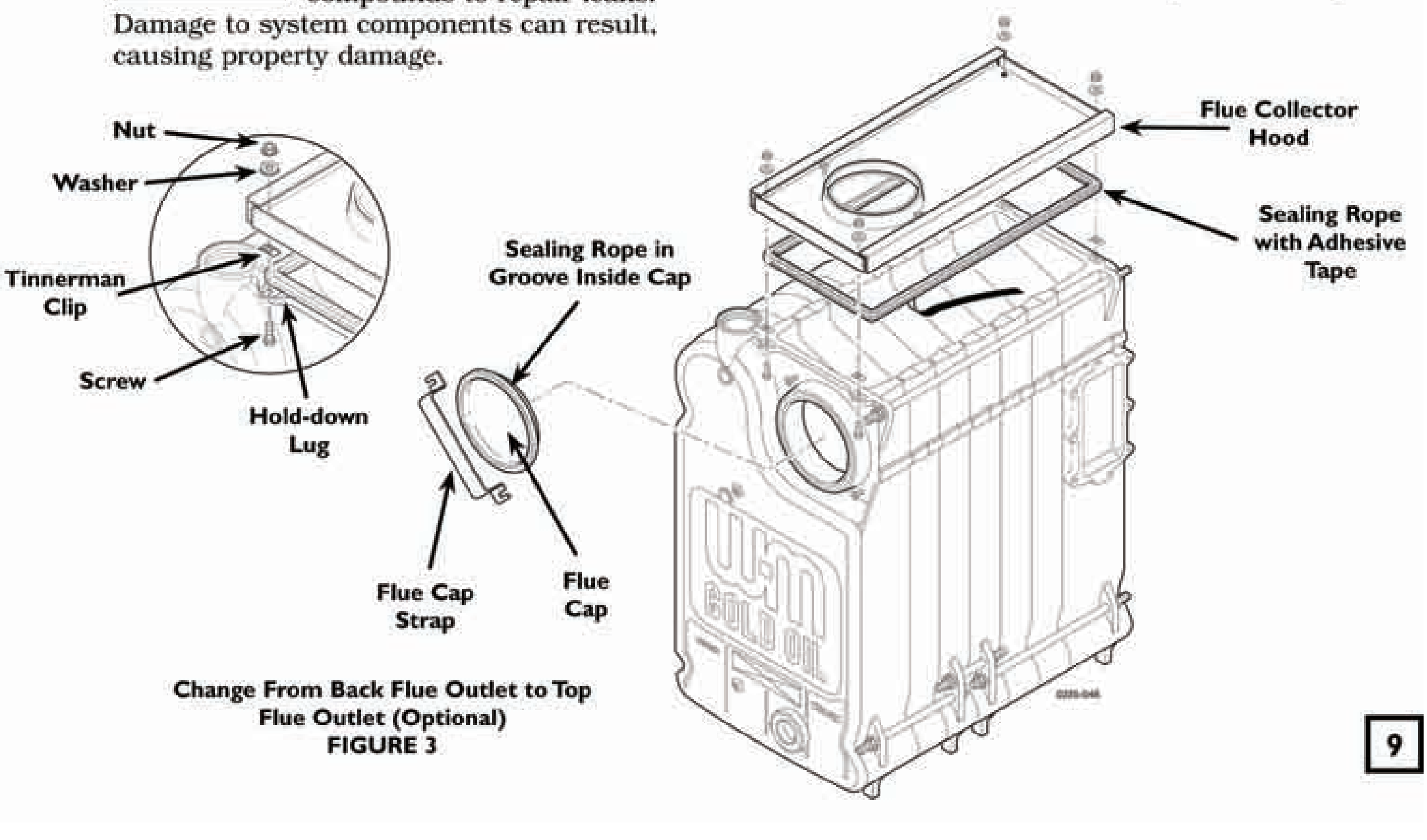
Install jacket (sizes 7 through 9 only):

Before installing jacket, remove burner mounting door. See jacket instructions for details.

Install boiler controls:

See Control Tapping Table and FIGURE 4 on page 10, and FIGURE 5 or 6 on page 11 to install controls.

1. Do not use Teflon tape to install probe-type low water cutoff; it will cause low water cutoff to work improperly.
2. Install tankless heater control if tankless heater is used. If not furnished, use operating control with maximum 10°F differential.
3. Make sure gauge glass is last control installed to prevent breakage.
4. Affix CP number label(s) on jacket front panel.



Change From Back Flue Outlet to Top Flue Outlet (Optional)
FIGURE 3

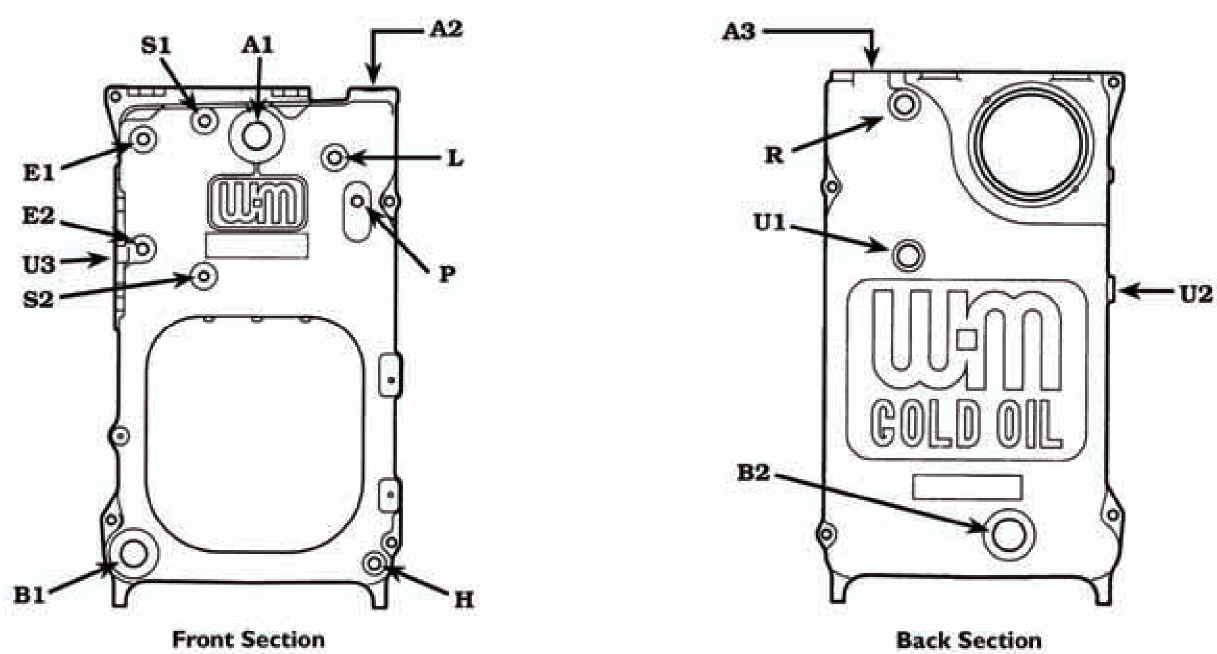
CONTROL TAPPING TABLE		
TAPPING	SIZE	FUNCTION
A1	1½"	Skim Tapping
A2	2½"	Supply Piping (sizes 3 - 9)
A3	2½"	Supply Piping (sizes 6 - 9)
B1	1½"	Plugged
B2	2"	Return Piping
E1 & E2	½"	Float LWCO
E1	½"	Steam Pressure Gauge and Limit Control when using Probe LWCO
E2	½"	Plugged when using Probe LWCO
H	¾"	Drain Valve
L	¾"	Steam Pressure Gauge and Limit Control when using Float LWCO (Plugged when using Probe LWCO)
P	¾"	Probe LWCO (Plugged when using Float LWCO)
R	¾"	Relief Valve
S1 & S2	½"	Gauge Glass
U1	1"	Indirect-Fired Water Heater/ Hot Water Baseboard Supply
U2	¾"	Operating Control for Tankless Heater (sizes 6-9) or Operating Control for Indirect-Fired Water Heater (sizes 3-9)
U3	¾"	Operating Control for Tankless Heater (Located in heater plate — sizes 3-5)

Install burner (also refer to instructions packed with burner):

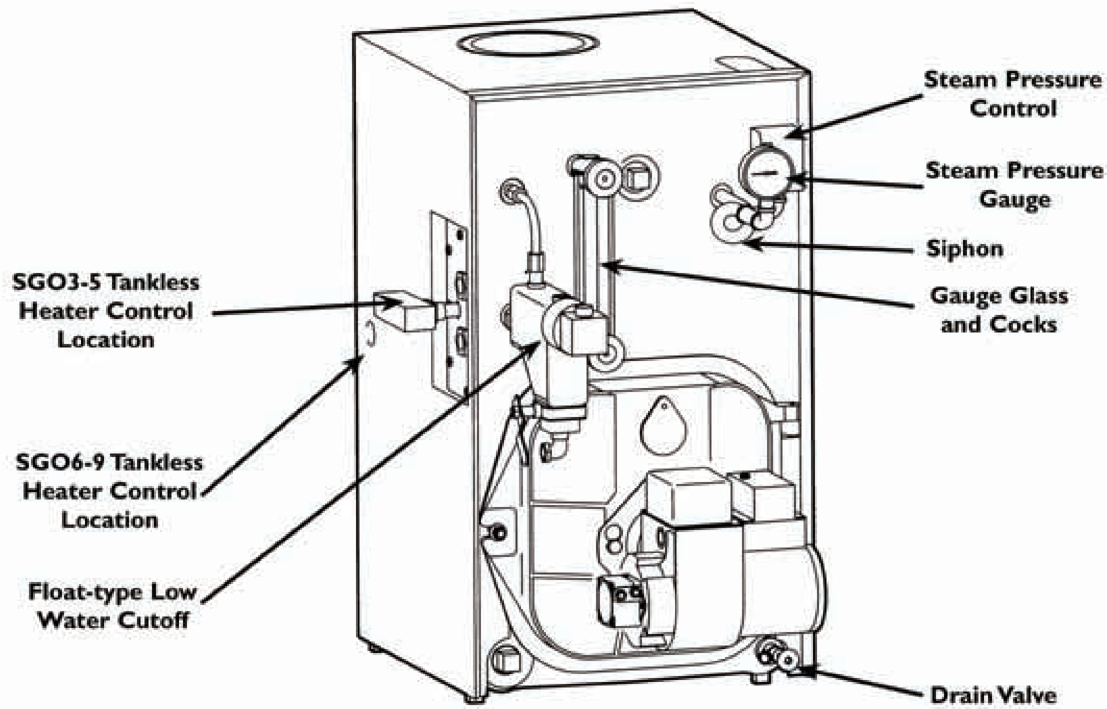
NOTICE Burners designed for use with Weil-McLain 68 boilers **must not** be used on GOLD Oil boilers. Contact individual burner manufacturers for GOLD Oil applications.

For **P-SGO** and **A-SGO** boiler:

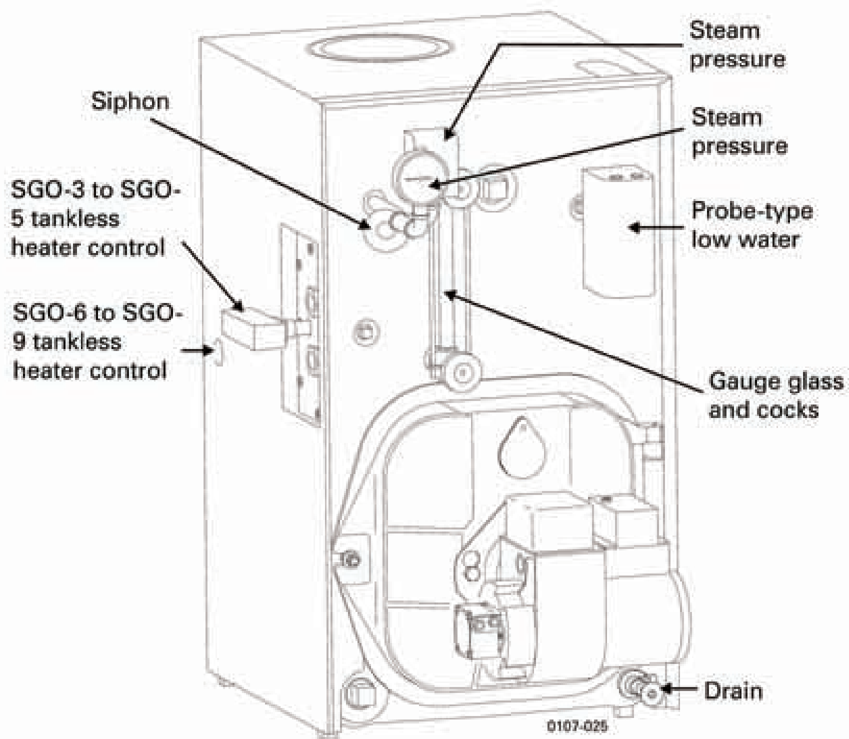
1. Secure universal mounting flange and gasket to burner mounting door. Use three bolts provided.
2. Secure burner on flange with three bolts.
3. Position burner so end of air tube is level to 1½° tilt down toward chamber. Open door to verify burner position. End of air tube should be flush to ¼" recessed from inside wall of burner door refractory. Check for secure placement of insulation on target wall, chamber floor and burner mounting door. Securely close door.



Control Tapping Location
FIGURE 4



Steam Boiler Controls With Float-Type LWCO (Optional Tankless Heater Control)
FIGURE 5



Steam Boiler Controls With Probe-Type LWCO (Optional Tankless Heater Control)
FIGURE 6

Connect Breeching

General chimney requirements:

- Designed for natural draft firing. Connect boiler to vertical chimney.

⚠ DANGER Insufficient draft can cause flue gas leakage and carbon monoxide emissions, which will lead to severe personal injury or death.

- Use vent material approved by local codes for oil-fired burners. In their absence, refer to:
  - — NFPA 31, Installation of Oil-Burning Equipment.
  - — NFPA 211, Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances.
  - — In Canada, refer to CSA B139, Installation Code for Oil-Burning Equipment.
- NFPA 211 requires chimney to be lined before connected to boiler.

⚠ DANGER Inspect existing chimney before installing new boiler. Failure to do any of the following will result in severe personal injury or death:

- — Clean chimney, including removal of blockage.
- — Repair or replace damaged pipe or liner.
- — Repair mortar and joints.

To prevent downdrafts, extend chimney at least 3 feet above highest point where it passes through roof and 2 feet higher than any portion of building within 10 feet. Increase chimney cross-sectional area and height at least 4% per 1,000 feet above sea level.

- Minimum clearances from vent pipe to combustible material:
  6 inches — Type "L" doublewall vent
  18 inches — Singlewall vent
- Minimum chimney sizes should be used.

NOTICE Oversized chimneys, outside masonry chimneys and/or derated inputs can result in condensation in chimney.

Connect breeching:

⚠ WARNING Long horizontal breechings, excessive number of tees and elbows, or other obstructions restricting combustion gas flow can result in possibility of condensation, flue gas leakage and carbon monoxide emissions, which can lead to severe personal injury or death.

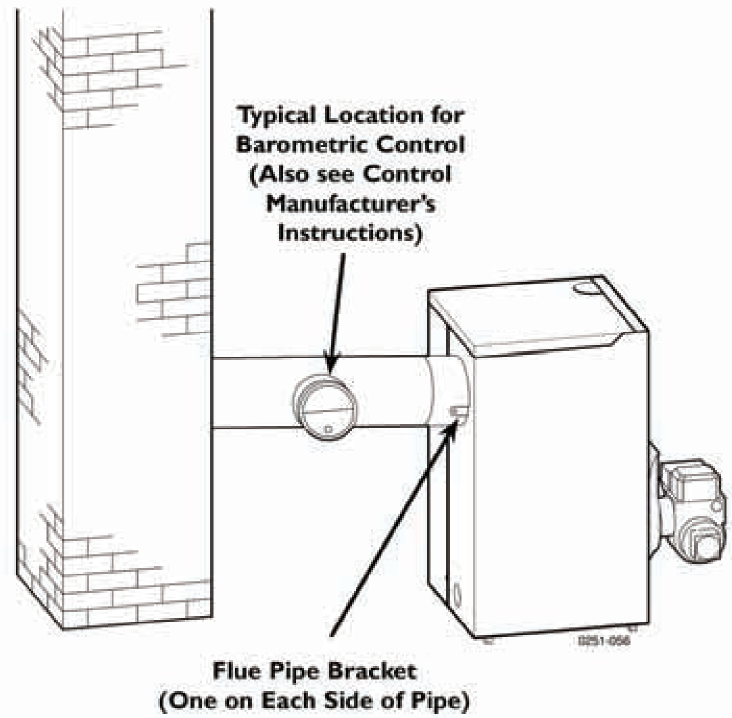
1. Install 2 flue pipe brackets.
2. Connect full-sized breeching when possible. See Minimum Chimney Size Table.
   - — Back outlet — see FIGURE 7.
   - — Top outlet — see FIGURE 8.
3. Connection must be made above bottom of chimney to avoid blockage. Breeching must not enter chimney far enough to cause obstruction. Use thimble or slip joint where breeching enters chimney to allow removal for cleaning.
4. When burner and boiler are properly installed, draft overfire will be approximately -0.01" to -0.02" W.C. Install barometric control in breeching, per control manufacturer's instructions, when excess draft needs to be relieved or to comply with applicable codes and regulations. Use draft gauge to adjust proper opening.
5. An induced draft fan for the chimney may be necessary if:
   - — Excessive resistance to flow of combustion gases can be expected.
   - — Cross-sectional area of chimney is smaller than minimum recommended.
   - — Chimney height is less than recommended.

   Seal all vent joints. Interlock burner with fan operation.

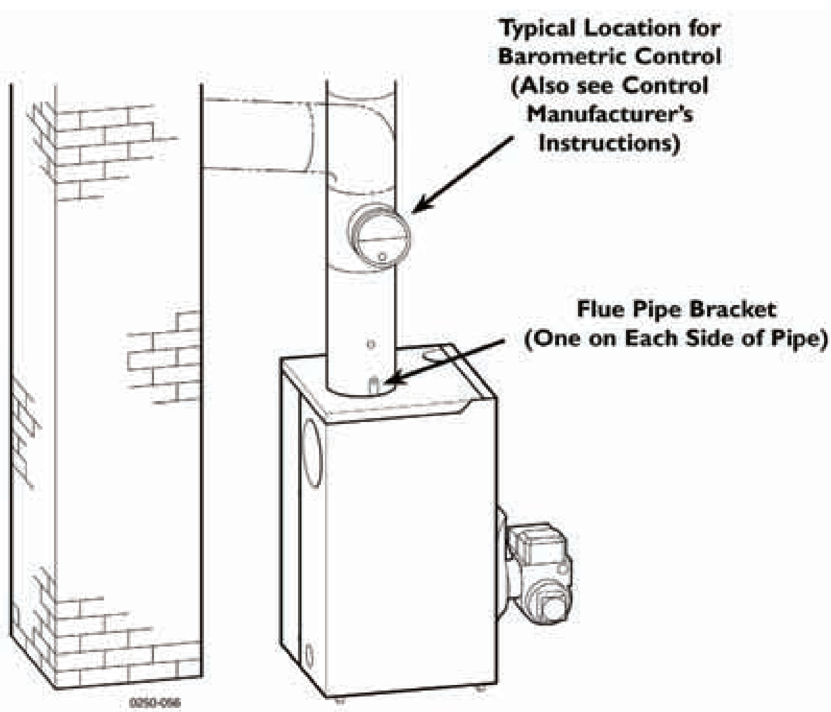
MINIMUM CHIMNEY SIZE TABLE

BOILER MODEL NUMBER	*** MINIMUM BREECHING DIAMETER	MINIMUM I=B=R CHIMNEY SIZE		MINIMUM CHIMNEY HEIGHT
		RECT.	ROUND	
SGO-3	5"	8" x 8" *	6"	15'
SGO-4	6"			
SGO-5	6"	8" x 8" *	7"	15'
SGO-6	7"			
SGO-7				
SGO-8	7"	8" x 12" **	7"	20'
SGO-9				

* 6¾" x 6¾" inside liner
** 6½" x 10½" inside liner
*** Flue collar on boiler is 7" diameter



Back Outlet Breeching Connection
FIGURE 7



Top Outlet Breeching Connection
FIGURE 8

General piping information:

- Hartford Loop piping arrangement and wet return are required for steam boilers.
- Maintain 24-inch minimum from waterline to bottom of header (minimum 50⁷/₈" from floor or top of foundation).
- When using condensate receiver, feed pump must be energized by boiler-mounted pump control.
- Use swing joints in steam piping.
- If installation is to comply with ASME or Canadian requirements, an additional pressure limit control is needed. Install control between existing pressure control and pressure gauge. Control **must** be installed with siphon (supplied with boiler) between control and boiler. Set control to minimum of 5 psi above setpoint of existing control and maximum setting of 15 psi. Wire as shown on boiler wiring diagram.

Install piping:

1. See Tables at right and FIGURE 9 on page 15 or FIGURE 10 on page 16.

   ⚠CAUTION Improperly piped systems or undersized piping can contribute to erratic boiler operation and possible boiler or system damage. Piping system must be installed as shown, using minimum pipe sizes shown. Consult your Weil-McLain distributor or sales office before installing alternate piping.

2. Install relief valve vertically in "R" tapping on back of boiler. See FIGURE 9 or 10 and also refer to tag attached to relief valve for manufacturer's instructions.

   ⚠WARNING Pipe relief valve discharge line near floor close to floor drain to eliminate potential of severe burns. Do not pipe to any area where freezing could occur. Do not plug, valve or place any obstruction in discharge line.

3. Float-type low water cutoff only — install blowdown line in bottom of cutoff. See FIGURE 9 or 10 and also refer to low water cutoff manufacturer's instructions for details.

   ⚠WARNING Pipe blowdown line near floor close to floor drain to eliminate potential of severe burns. Do not pipe to any area where freezing could occur. Do not plug, valve or place any obstruction in discharge line.

STEAM PIPING SIZE TABLE FOR ONE AND TWO-PIPE SYSTEMS

BOILER MODEL NUMBER	RISER PIPE SIZE *		HEADER PIPE SIZE "H" **	EQUALIZER PIPE SIZE "J"
	A	B		
SGO-3	2½" ♠	—	2½"	1½"
SGO-4	2½" ♠	—	2½"	1½"
SGO-5	2½"	—	3"	1½"
SGO-6	2½"	2½"	3"	1½"
SGO-7	2½"	2½"	3"	1½"
SGO-8	2½"	2½"	3"	1½"
SGO-9	2½"	2½"	3"	1½"

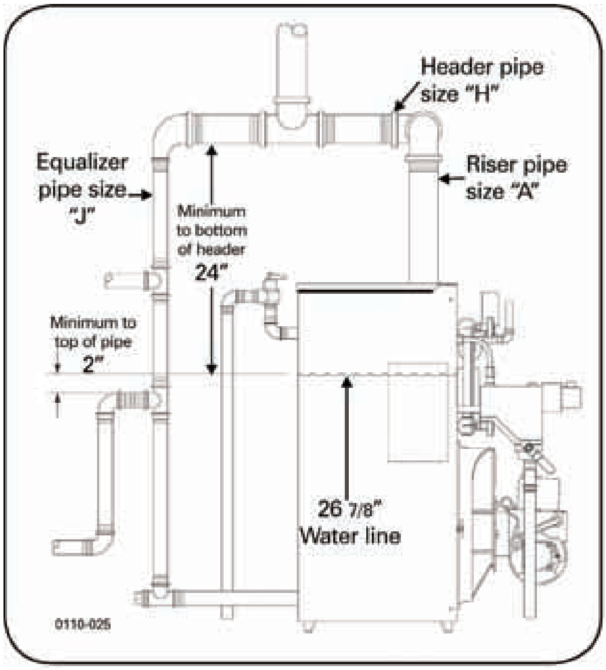
STEAM PIPING SIZE TABLE FOR ONE-PIPE COUNTERFLOW SYSTEMS

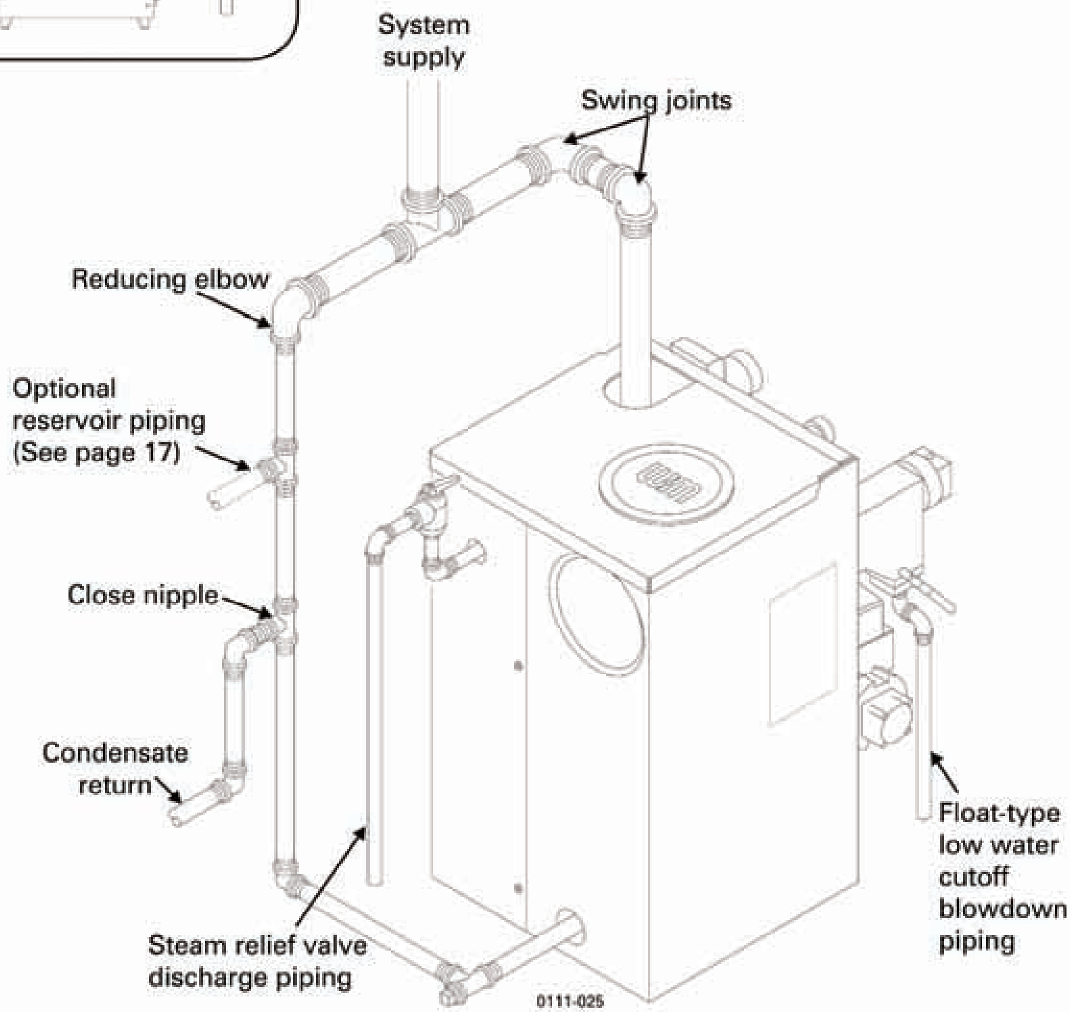
BOILER MODEL NUMBER	RISER PIPE SIZE *		HEADER PIPE SIZE "H" **	EQUALIZER PIPE SIZE "J"
	A	B		
SGO-3	2½"	—	2½"	1½"
SGO-4	2½"	—	2½"	1½"
SGO-5	2½"	—	3"	1½"
SGO-6	2½"	2½"	4"	1½"
SGO-7	2½"	2½"	4"	1½"
SGO-8	2½"	2½"	4"	1½"
SGO-9	2½"	2½"	4"	1½"

* Based on ASHRAE Fundamentals Handbook recommendations, allowing ½ oz. pressure drop at 0 psig.

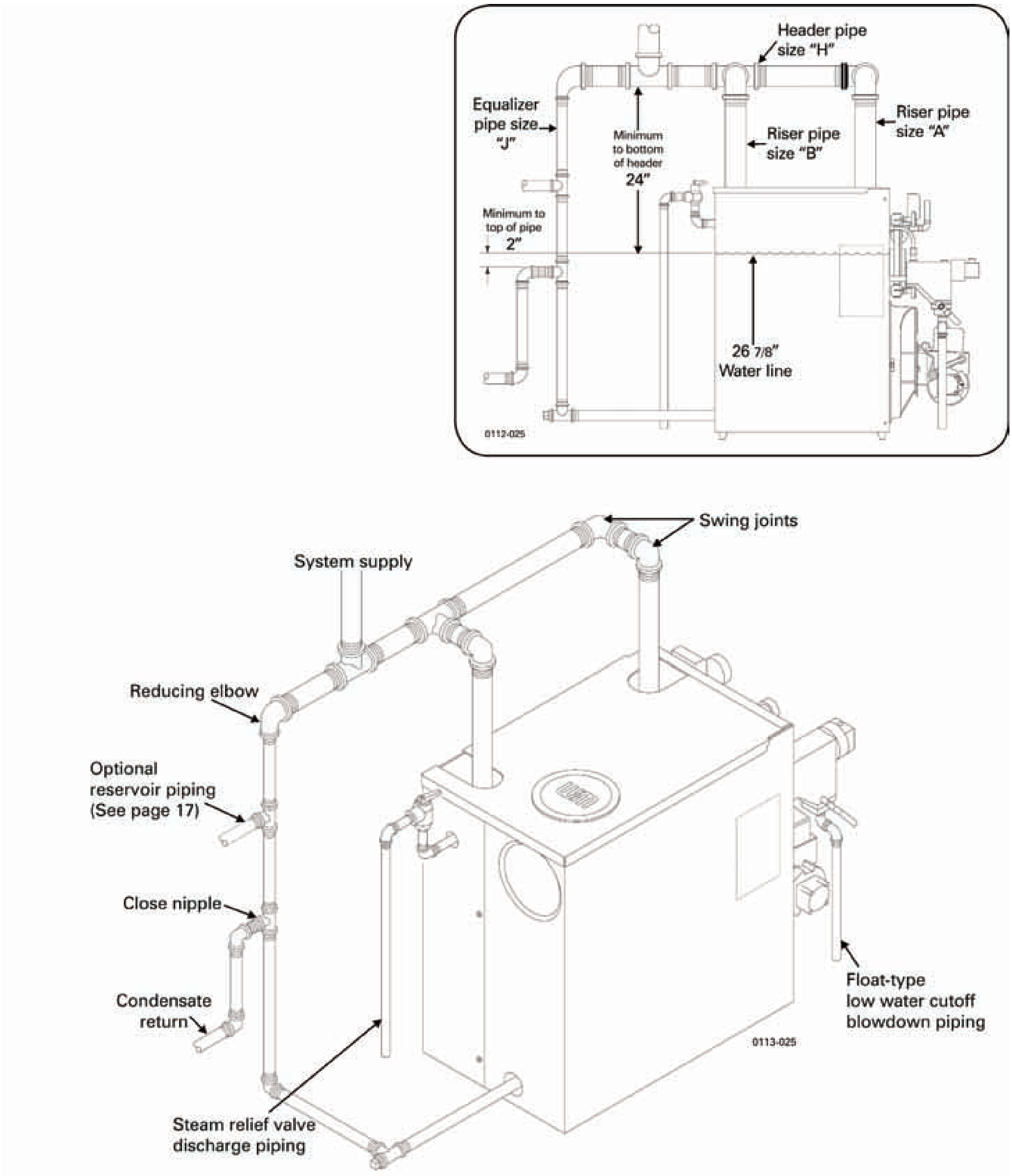
** Based on ASHRAE Fundamentals Handbook recommendations, allowing 2 oz. pressure drop per 100 feet of pipe at 3.5 psig. Maintain minimum 24" height from waterline to bottom of header.

♠ Can be reduced to 2".





Steam Piping for Sizes 3 through 5
(See Page 16 for Sizes 6 through 9)
FIGURE 9



Steam Piping for Sizes 6 through 9
(See Page 15 for Sizes 3 through 5)
FIGURE 10

Optional reservoir piping:

Modern steam boilers are designed to steam for less time than older, larger boilers. When replacing an older steam boiler, the system condensate return time may be longer than the steaming time. This can cause the following problems:

- Boilers fitted with an automatic water feed could overfill.
- Units fitted with only a low water cutoff would shut down and cycle while waiting for condensate to return.

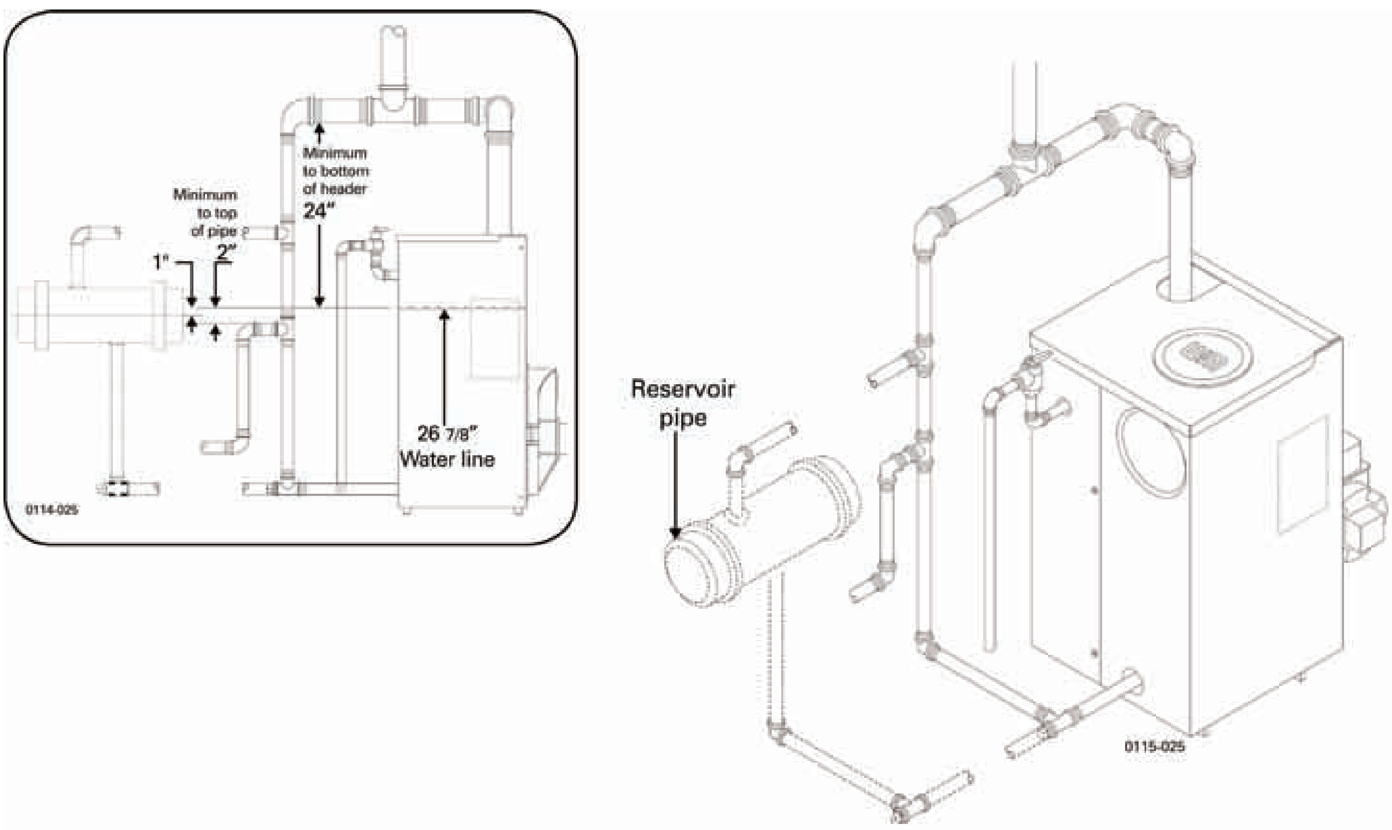
To size and install reservoir piping, see FIGURE 11 and Bulletin AE-8403 (available through your Weil-McLain distributor or sales office):

1. Pipe boiler as shown on pages 14 through 16.
2. Use 8" diameter reservoir pipe.
3. Locate centerline of reservoir pipe 1" below 26 7/8" boiler waterline.

CONDENSATE RECEIVER CAPACITY TABLE

			MINIMUM CONDENSATE RECEIVER CAPACITY – GAL.				
BOILER MODEL	I=B=R GROSS OUTPUT LBS STEAM PER HOUR	GALLONS CONDENSATE PER HOUR	15 MIN.* BOILER OPERATION	30 MIN.* BOILER OPERATION	45 MIN.* BOILER OPERATION	60 MIN.* BOILER OPERATION	RECOMMENDED CONDENSATE FEED PUMPING RATE GPM AT 15 PSI
SGO-3	114	14	4	8	12	16	0.5
SGO-4	150	18	5	11	16	22	0.6
SGO-5	180	22	6	13	19	26	0.7
SGO-6	216	26	8	16	23	31	0.9
SGO-7	246	30	9	18	27	35	1.0
SGO-8	274	33	10	20	30	39	1.1
SGO-9	303	36	11	22	33	44	1.2

* Maximum time to when condensate returns to boiler.



Typical Piping (One Riser Shown on Boiler)
FIGURE 11

Connect Tankless Heater Piping

DANGER **Hot Water Can Scald!**

- Consumer Product Safety Commission and some states recommend domestic hot water temperature of 130°F or less.
- When installing an automatic mixing valve, selection and installation **must** comply with valve manufacturer's recommendations and instructions.
- Water heated to a temperature suitable for clothes washing, dish washing and other sanitizing needs will scald and cause injury.
- Children and elderly, infirm or physically handicapped persons are more likely to be injured by hot water. Never leave them unattended in or near a bathtub, shower or sink. Never allow small children to use a hot water faucet or draw their own bath. If anyone using hot water in the building fits this description, or if state laws or local codes require certain water temperatures at hot water faucets, take special precautions:
  - — Install automatic mixing valve set according to those standards.
  - — Use lowest practical temperature setting.
  - — Check water temperature immediately after first heating cycle and after any adjustment.

WARNING Studies have indicated that dangerous bacteria can form in potable water distribution systems if certain minimum water temperatures are not maintained. Contact local health department for more information.

To pipe tankless heater:

1. Size piping no smaller than tankless heater inlet and outlet.
2. Following controls (furnished by others) must be installed:
   a. Automatic mixing valve. See FIGURE 12.

      (Read **DANGER** at left.)

   b. Flow regulating valve. Size according to intermittent draw of tankless heater. See Table below. Follow valve manufacturer's instructions to install.
3. Additional anti-scald devices may be installed at each hot water faucet, bath and shower outlet.
4. In hard water areas, soften cold domestic supply water to heaters to prevent lime build-up.

TANKLESS HEATER RATINGS TABLE

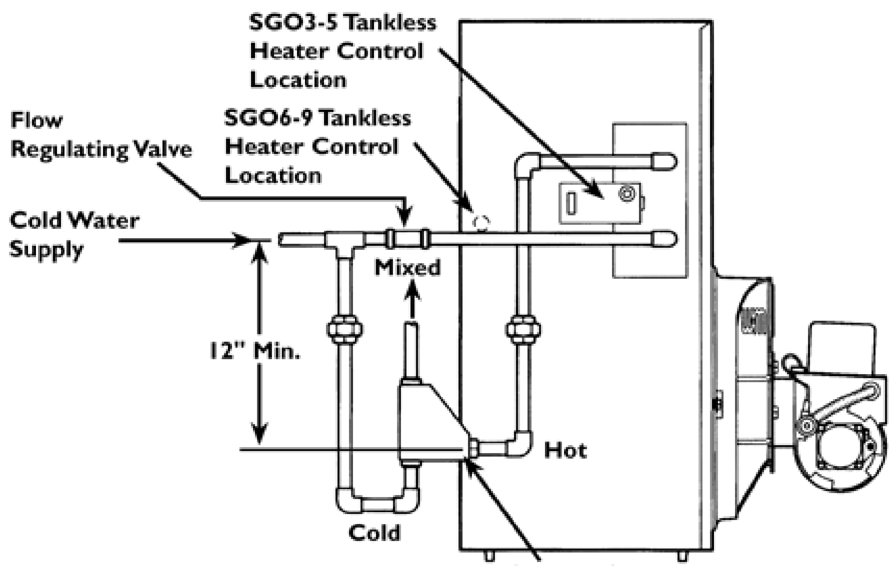
BOILER MODEL NUMBER *	HEATER NUMBER	INTERMITTENT DRAW RATINGS (GPM) * *	INLET AND OUTLET TAPPING SIZES
SGO-3	35-S-29	3.25	¾"
SGO-4	35-S-29	3.50	¾"
SGO-5	35-S-29	3.75	¾"
SGO-6	35-S-29	4.00	¾"
SGO-7	35-S-29	4.00	¾"
SGO-8	35-S-29	4.00	¾"
SGO-9	35-S-29	4.00	¾"

* To avoid supplying steam to system during summer tankless operation, raise water level to one inch above normal water line.

** Gallons of water per minute heated from 40°F to 140°F with 200°F boiler water temperature. Tested in accordance with *I=W=H Testing and Rating Standard for Indirect Tankless Water Heaters Tested with Boilers.*

These single wall heat exchangers comply with National Standard Plumbing Code provided that:

- Boiler water (including additives) is practically non-toxic, having a toxicity rating or class of 1, as listed in *Clinical Toxicology of Commercial Products.*
- Boiler water pressure is limited to max. 15 psig by approved steam relief valve.



Tankless Heater Piping
FIGURE 12

Connect Wiring

P A

General wiring requirements:

⚠WARNING Electric shock hazard. Can cause severe personal injury or death if power source, including service switch on boiler, is not disconnected before installing or servicing.

- Installations must follow these codes:
  - — National Electrical Code, ANSI/NFPA 70, latest edition and any additional national, state or local codes.
  - — In Canada, CSA C22.1 Canadian Electrical Code Part One and any local codes.
- Wiring must be N.E.C. Class 1. If original wire as supplied with boiler must be replaced, type 105°C wire or equivalent must be used. Supply wiring to boiler and additional control wiring must be 14 ga. or heavier.
- Provide electrical ground at boiler as required by codes.

Thermostat wiring:

- Install thermostat on inside wall away from influences of drafts, hot or cold water pipes, lighting fixtures, television, sun rays or fireplaces.
- Follow instructions with thermostat. If it has a heat anticipator, set heat anticipator in thermostat to match power requirements of equipment connected to it. Boiler wiring diagrams give setting for standard equipment.

Junction box (furnished):

- Junction box houses electrical connections for all boiler components.
- "P" boilers have harnesses furnished.
- "A" boilers are furnished with burner and limit harnesses.
- All field-provided high voltage wiring must be sheathed in flexible metal conduit.
- Connect incoming line voltage "HOT" wire to service switch, and neutral wire to white wire. Field-install equipment ground wire to green wire with wire nut.
- Service switch (15 amp) is provided with boiler. "A" boilers — install switch as shown.
- Some local codes may require an emergency shut-off switch installed at a location away from boiler. Follow local codes.

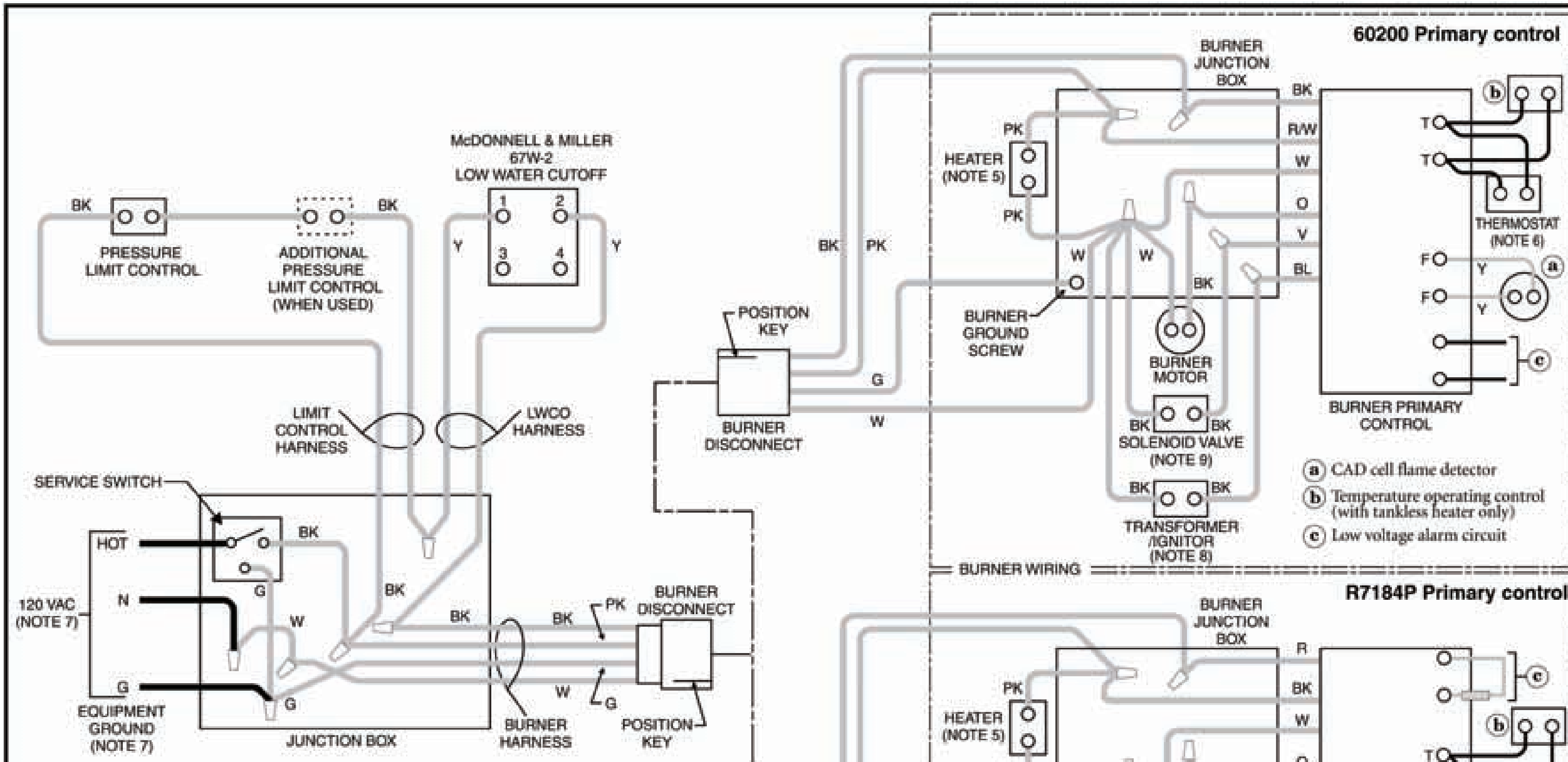
Burner wiring:

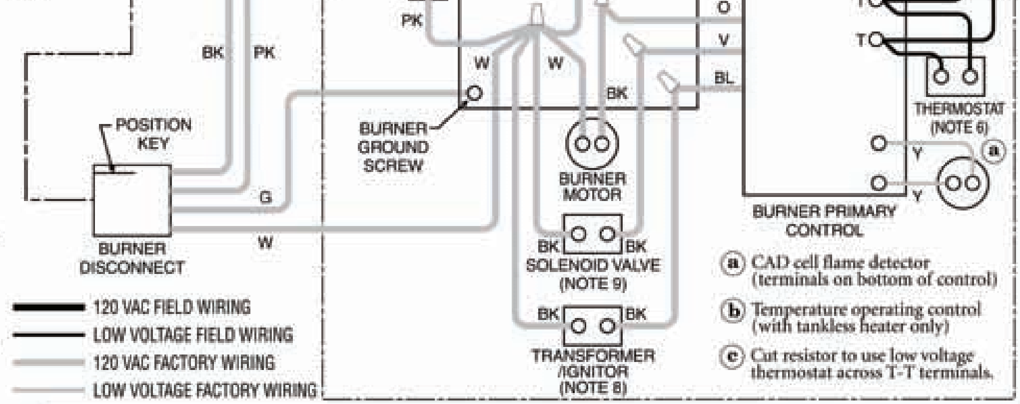
- Burner harness incorporates a disconnect plug, providing a convenient way to disconnect wiring when burner mounting door is opened.
- All "P" boilers have a power disconnect plug installed on burner.
- On "A" boilers, mount the plug (provided in steam trim carton) on the burner housing as shown in FIGURE 13 or 14. For Carlin burners, screw burner plug into threaded conduit coupling, then mount this assembly to the burner housing using the chase nipple. Route wires through housing and make connections in burner junction box as shown in boiler wiring diagram.

To wire boilers, refer to the following pages:

Pages 20 to 21 Float-Type LWCO

Pages 22 to 23 Probe-Type LWCO





WARNING **Electrical shock hazard — can cause severe injury or death. Disconnect power before installing or servicing.**

NOTICE **Burners with Beckett Clean Cut Pump must be used with a primary control that has a valve-on delay (pre-purge). Controls shown have valve on delay (see control manufacturer's instructions for timings.)**

NOTES:

1. All wiring must be installed in accordance with N.E.C. and any other national, state, or local code requirements. For Canadian installations, all wiring must comply with the Canadian Electrical Code.
2. All wiring must be N.E.C. Class 1.
3. Refer to control component instructions packed with the boiler for application information.
4. If any of the original wire as supplied with the appliance must be replaced, use minimum 105 °C wire or equivalent.
5. Nozzle line heater is standard on Carlin EZ burners. Leave wire capped and unattached if not used.
6. Set thermostat heat anticipator to 0.20 amps.
7. Connect incoming line voltage "HOT" wire to service switch and neutral wire to white wire. Connect ground wire to green wire with wire nut.
8. Original equipment transformer/ignitor supplied with boiler has lead wires colored W and BL/W, W and BK, or BK and BK.
9. Original equipment solenoid valve supplied with boiler has lead wire colors W and BK, or BK and BK.

SGO Oil-Fired Boiler Wiring Diagram

- **Steam, with or without tankless heater**
- **Float-type low water cutoff**

WEIL-McLAIN

Weil-McLain 500 Blaine St. Michigan City, IN 46360-2388

PART NUMBER GO-A037-B/1201

Float-Type Low Water Cutoff

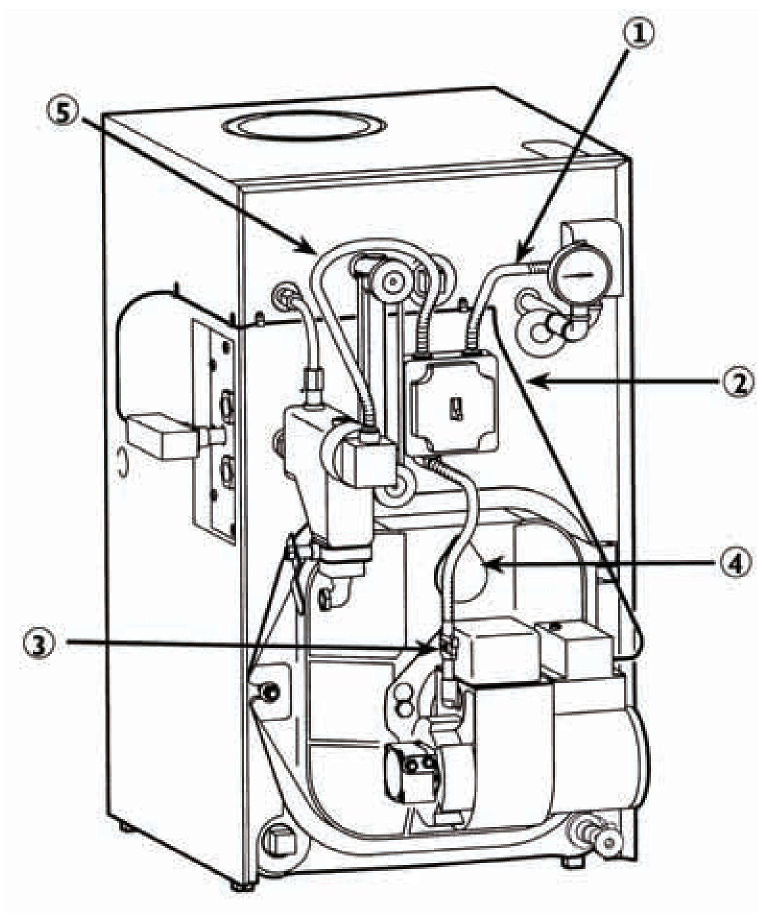
① **Pressure Control Wiring Harness**

② **Tankless Heater Control Wiring**

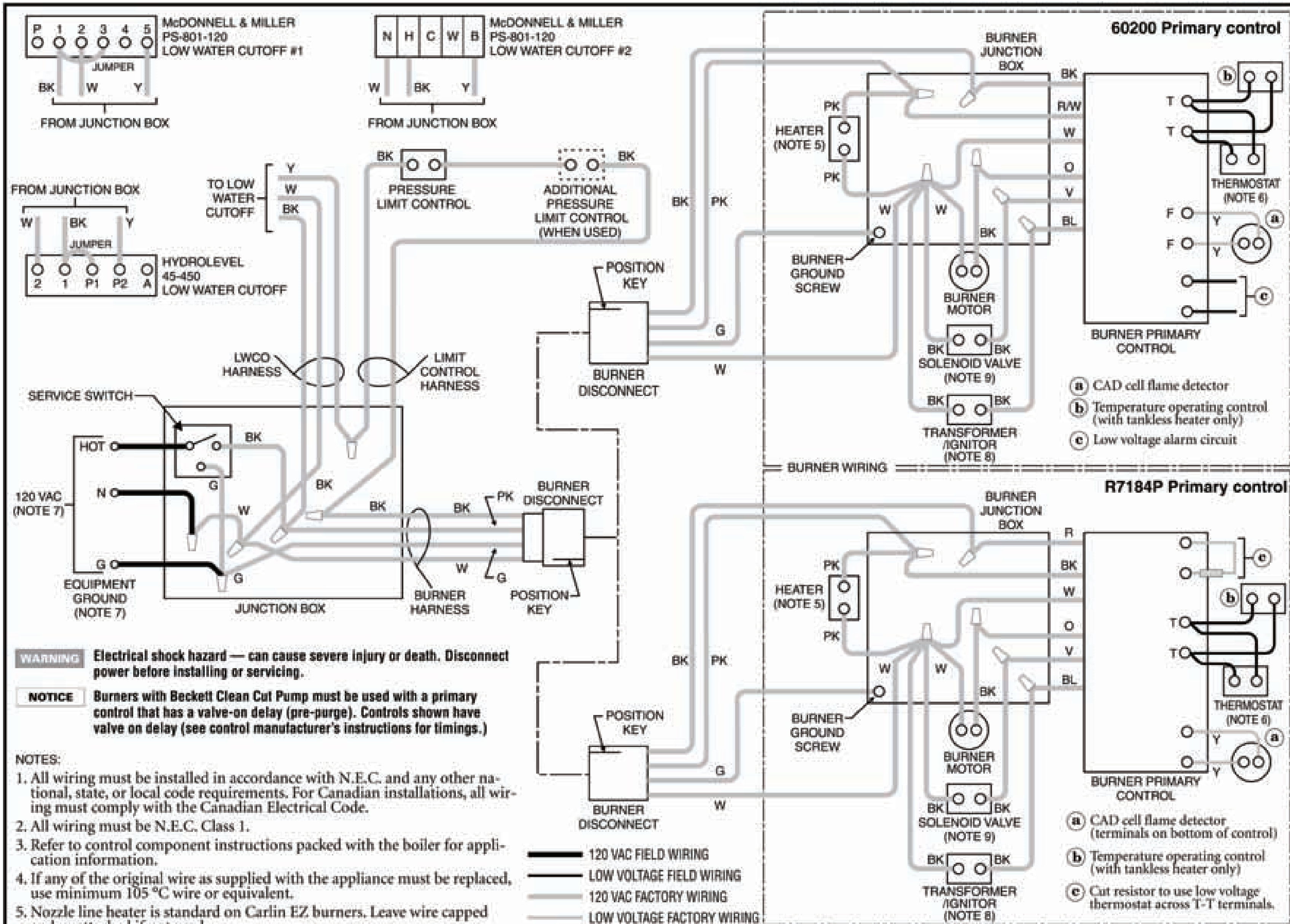
③ **Burner Disconnect Plug**

④ **Burner Wiring Harness**

⑤ **Low Water Cutoff Wiring Harness not furnished on "A" Boilers**



Boiler Wiring for Float-Type LWCO
FIGURE 13



WARNING Electrical shock hazard — can cause severe injury or death. Disconnect power before installing or servicing.

NOTICE Burners with Beckett Clean Cut Pump must be used with a primary control that has a valve-on delay (pre-purge). Controls shown have valve on delay (see control manufacturer's instructions for timings.)

NOTES:

1. All wiring must be installed in accordance with N.E.C. and any other national, state, or local code requirements. For Canadian installations, all wiring must comply with the Canadian Electrical Code.
2. All wiring must be N.E.C. Class 1.
3. Refer to control component instructions packed with the boiler for application information.
4. If any of the original wire as supplied with the appliance must be replaced, use minimum 105 °C wire or equivalent.
5. Nozzle line heater is standard on Carlin EZ burners. Leave wire capped and unattached if not used.
6. Set thermostat heat anticipator to 0.20 amps.
7. Connect incoming line voltage "HOT" wire to service switch and neutral wire to white wire. Connect ground wire to green wire with wire nut.
8. Original equipment transformer/ignitor supplied with boiler has lead wires colored W and BL/W, W and BK, or BK and BK.
9. Original equipment solenoid valve supplied with boiler has lead wire colors W and BK, or BK and BK.

SGO Oil-Fired Boiler Wiring Diagram

- **Steam, with or without tankless heater**
- **Probe-type low water cutoff**

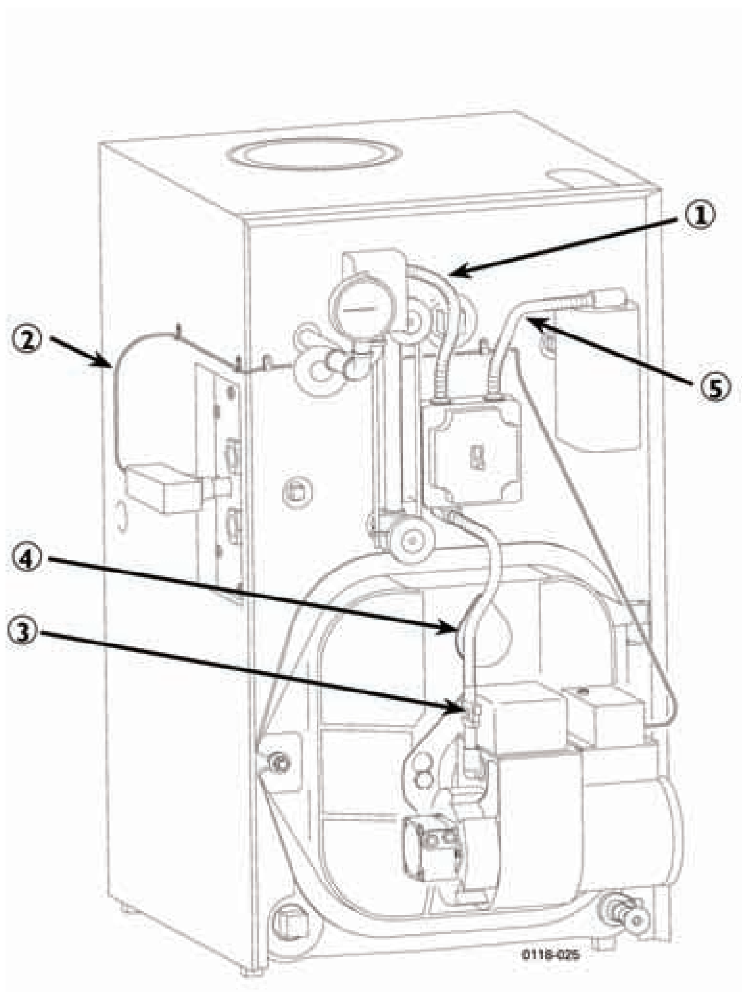
WEIL-McLAIN

Weil-McLain 500 Blaine St. Michigan City, IN 46360-2388

PART NUMBER GO-A038-B/1201

Probe-Type Low Water Cutoff

1. **Pressure Control Wiring Harness**
2. **Tankless Heater Control Wiring**
3. **Burner Disconnect Plug**
4. **Burner Wiring Harness**
5. **Low Water Cutoff Wiring Harness not furnished on "A" Boilers**



Boiler Wiring for Probe-Type LWCO
FIGURE 14

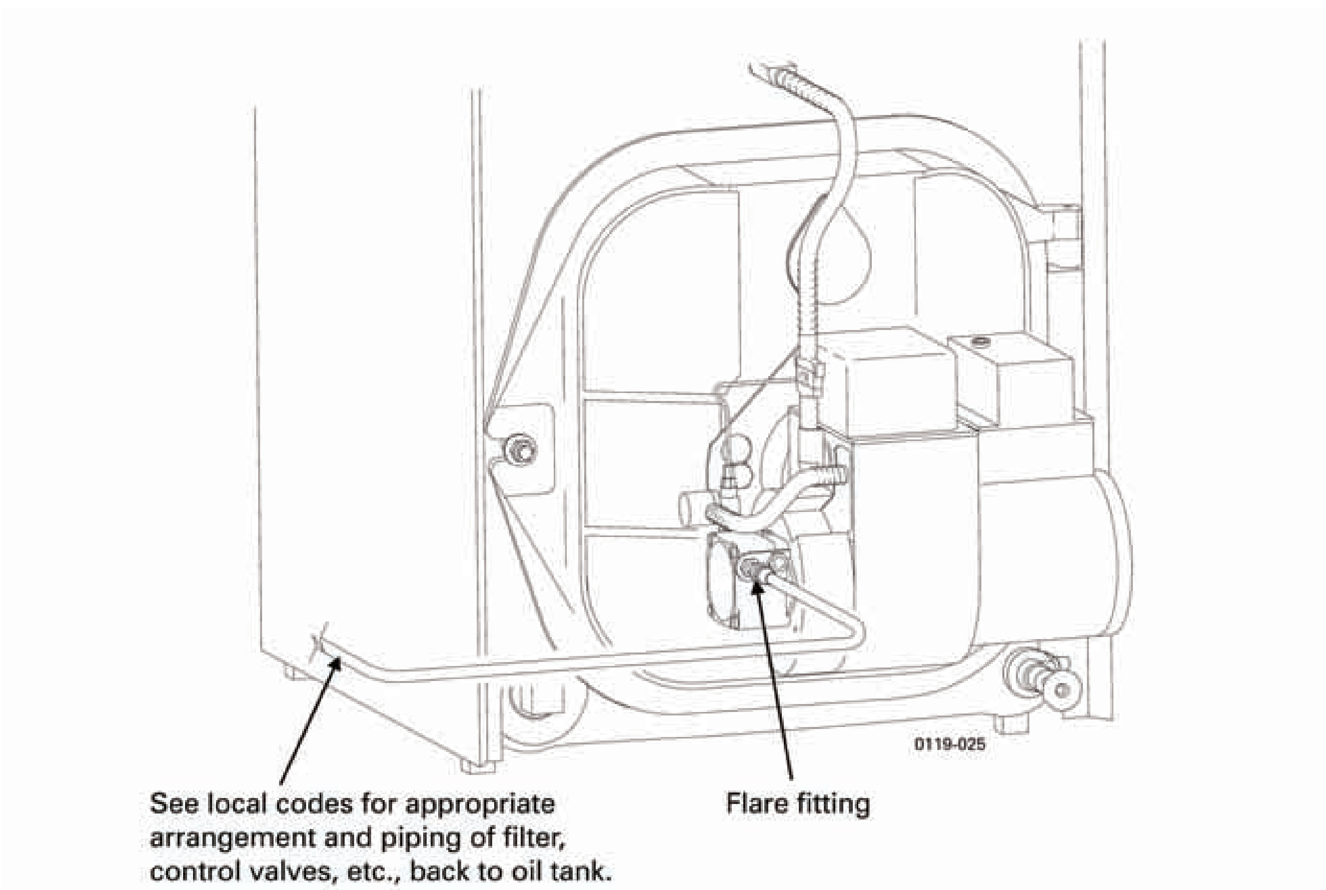
Connect Oil Piping

General oil piping requirements:

- Location and installation of oil tanks, oil piping and burners must follow:
  - — NFPA 31, Standard for the Installation of Oil-Burning Equipment.
  - — In Canada, CSA B139, Installation of Oil-Burning Equipment.
  - — Local codes and regulations.
  - — Information provided with burner and fuel pump.
- If any part of fuel oil tank is above level of burner, an anti-siphon device must be used to prevent flow of oil in case of oil line break.
- Support oil lines as required by codes.
- Make tank connections with swing joints or copper tubing to prevent breaking in case the tank settles. Make swing joints so they will tighten as tank settles. Non-hardening pipe joint compounds should be used on all threads.
- **WARNING** Do not use Teflon tape as an oil pipe sealant. It can cause valves to fail, creating hazards. Do not use compression fittings, only flare fittings.
- Underground pipe must be run in a casing to prevent oil leaking into ground or under floor. Check local codes for information.

Oil piping connection at burner:

See FIGURE 15 for recommended connection at burner, allowing burner mounting door to swing open completely for servicing.



Recommended Oil Piping Connection to Burner
FIGURE 15

DANGER Follow information below to prevent severe personal injury, death or substantial property damage:

- Do not use gasoline crankcase drainings or any oil containing gasoline. See burner manual for proper fuel oil.
- Do not attempt to start burner when excess oil has accumulated, when unit is full of vapor or when combustion chamber is very hot.
- Do not start burner unless collector hood, flue cap, jacket cap, breeching and burner mounting door are secured in place.
- Never burn garbage or paper in the boiler.
- Never leave combustible material around it.

Fill the system:

1. Do not fill (except for leakage tests) until boiler is ready to be fired.
2. Fill to normal water line as indicated on jacket front panel.
3. Boiler water pH 7.0 to 8.5 is recommended.

   NOTICE Failure to maintain recommended pH level can cause section failure and leaks.

4. Follow "Skim steam boiler" to assure proper operation.

Tips for steam systems:

- Check boiler and system piping for leaks. Continual makeup water will reduce boiler life. Minerals can build up in sections, reducing heat transfer and causing cast iron to overheat, resulting in section failure.

  CAUTION Failure to maintain recommended pH and repair leaks can cause section iron corrosion, leading to section failure and leaks. Do not use petroleum-based sealing or stop-leak compounds in boiler system. Damage to system components can result.

- For pH conditions outside 7.0 to 8.5 range or unusually hard water areas (above 7 grains hardness), consult local water treatment company.

Skim steam boiler:

NOTICE Clean new steam boilers to remove any impurities. Failure to properly clean can result in violent water level fluctuations, water passing into steam mains, or high maintenance costs on strainers, traps or vents. Skim boiler only. Do not clean old piping or leaks can occur.

CAUTION Do not use petroleum-based compounds in boiler system. Damage to system components can result, causing property damage.

1. Provide 1½" skim piping from skim tapping to floor drain. Add a tee in piping to observe skim water level. Raise waterline to midpoint of skim tapping.
2. Fire burner to maintain water temperature below steaming temperature during skimming process.
3. Feed in water to maintain water level. Cycle burner to prevent rise in steam pressure. Continue skimming until discharge is clear.
4. While boiler is warm, but not **hot**, drain boiler through drain valve.
5. Remove skim piping. Close drain valve. Fill with fresh water to normal waterline. Start burner and steam for 15 minutes to remove dissolved gases. Stop burner.
6. Check traps and air vents for proper operation.
7. Process may need to be repeated after several weeks of operation.

To place in operation:

1. Verify boiler is filled with water to normal waterline as indicated on jacket front panel.
2. Open burner door and verify rear target wall, floor and burner door insulations are in proper position and condition.
3. Verify burner mounting door is closed tightly and burner wiring harness is connected to junction box.
4. Factory burner adjustment and settings may not be suitable for specific job conditions. See Appendix, page 27.

   WARNING Make final burner adjustments using combustion test equipment to assure proper operation. Do not fire boiler without water. Sections will overheat, damaging boiler and resulting in substantial property damage.

5. Check boiler and system piping for leaks. See "Tips for steam systems."
6. Inspect breeching and venting for proper operation.

For additional information, refer to instructions packed with boiler or burner:

- **Burner Manual**
- **Maintenance and Service Guide for GOLD Oil Steam Boilers**

Check-Out Procedure

Check off steps as completed:

- ❑ 1. Boiler properly filled with water?
- ❑ 2. Boiler piping checked for leaks (including tankless heater, if used)?
- ❑ 3. System vents operating properly?
- ❑ 4. Boiler properly skimmed?
- ❑ 5. Air purged from oil piping? Piping checked for leaks?
- ❑ 6. Flue cap in place and tightened? Burner door closed, sealed and nut tight? Burner plugged in and service switch on?

  ⚠WARNING Obtain gas-tight seal to prevent possible flue gas leakage and carbon monoxide emissions, leading to severe personal injury or death.

- ❑ 7. Proper draft and burner flame? Final adjustment made with combustion test equipment?
- ❑ 8. Test pressure control: While burner is operating, move indicator on limit control below actual boiler steam pressure. Burner should go off. Raise setting on pressure control above steam pressure and burner should re-ignite.
- ❑ 9. Test low water cutoff(s): Follow control manufacturer's instructions for testing procedures. Make sure burner goes off when control responds to low water condition. Burner should re-ignite when proper water level is restored.
- ❑ 10. Test additional field-installed controls: If boiler has additional operating control or other controls, test for operation as outlined by control manufacturer. Burner should be operating and should go off when controls are tested. When controls are restored, burner should re-ignite.
- ❑ 11. Limit control set to system pressure requirements?
- ❑ 12. Thermostat heat anticipator setting (if available) set properly? Refer to "Connect wiring," page 19.
- ❑ 13. Boiler cycled with thermostat? Raise to highest setting and verify boiler goes through normal start-up cycle. Lower to lowest setting and verify boiler goes off.
- ❑ 14. Observed several operating cycles for proper operation?
- ❑ 15. Set room thermostat(s) to desired room temperature?
- ❑ 16. Completed Installation and Service Certificate below?
- ❑ 17. Reviewed Maintenance and Service Manual with owner or maintenance person and instructed person to keep for future reference?
- ❑ 18. Returned all instructions provided with boiler to its envelope and placed with boiler for future reference?

Installation and Service Certificate

Date Installed: ________________________________

Boiler Model Number: ______________**Series:** ________

CP Number(s):________________________________

Measured Btu or GPH Input:____________________

- ❑ **Installation instructions have been followed.**
- ❑ **Check-out procedure has been performed.**
- ❑ **Above information is certified to be correct.**
- ❑ **Information received and left with owner/ maintenance person.**

Installer:____

(Company) **(Address)** **(Phone)**

____

(Installer's Signature)

Burner adjustments for "P" and "A" boilers:

⚠WARNING Final burner adjustments must be made using combustion test equipment to assure proper operation. Do not fire boiler without water or sections will overheat.

1. Refer to burner manual for start-up.
2. Allow boiler to heat to design condition.
3. Using combustion test equipment, adjust burner for:
   a. CO_2 between 11% and 12% and 0 smoke.
   b. -0.01" to -0.02" W.C. draft in combustion chamber.

To connect SGO boilers to indirect-fired water heaters:

Install and wire per water heater manual provided with water heater.

If boiler already has a tankless heater installed:

- Remove tankless heater and install cover plate.

  OR

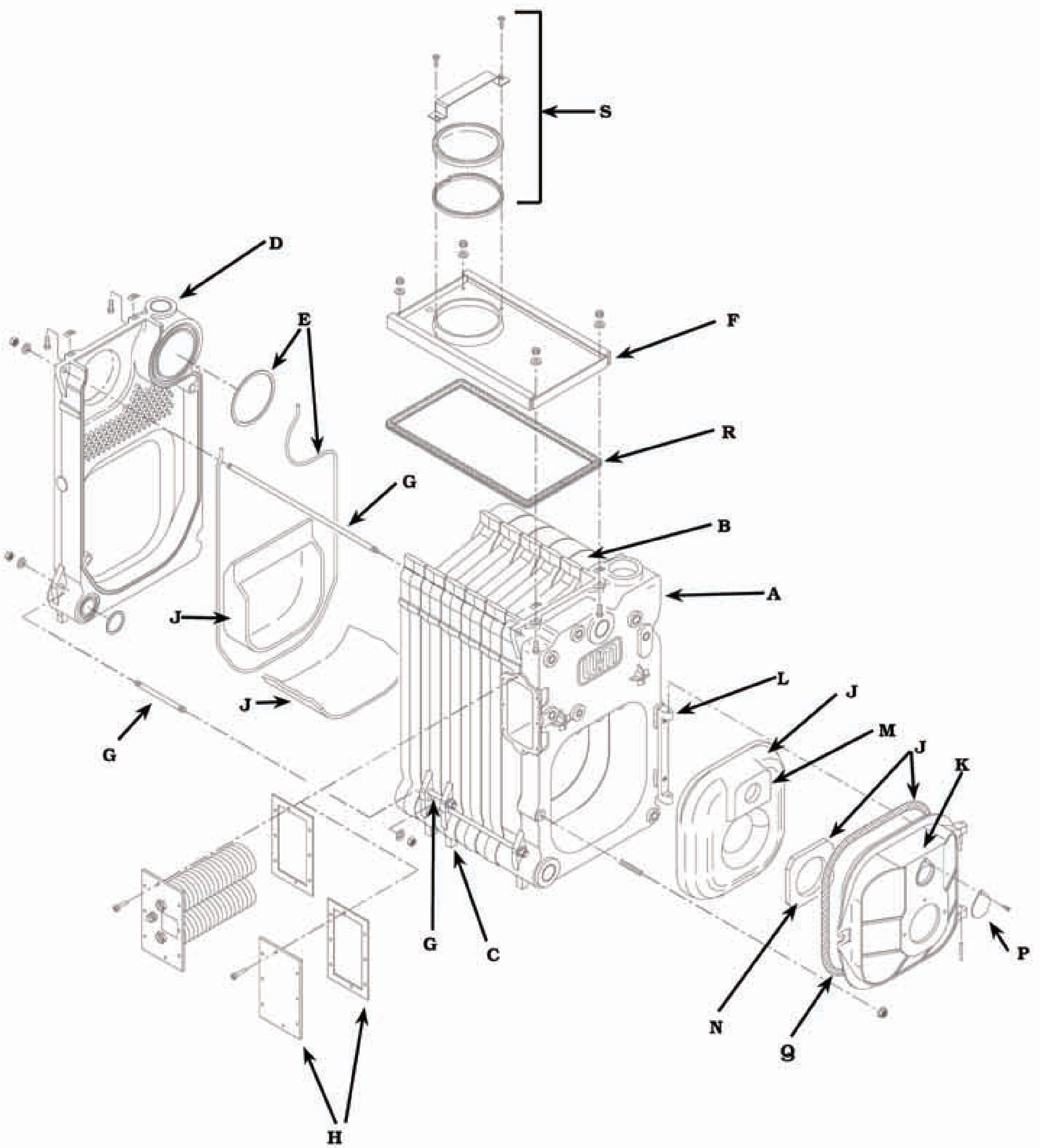
- Leave tankless heater installed. Drain coil and remove piping. Do not plug holes in tankless heater front plate.

Parts List

NOTICE **Repair parts must be purchased through Weil-McLain for the specific boiler as indicated in the list below. Results from using modified or other manufactured parts will not be covered by warranty and may damage boiler or impair operation.**

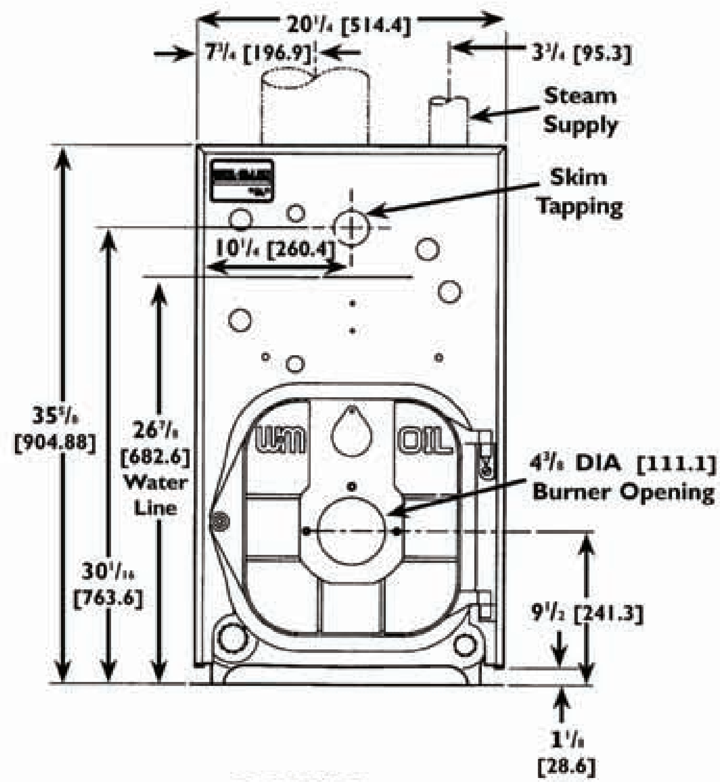
Fig. No.	Description	Weil-McLain Part Number
A	Wide Front Section (7011)	316-700-245
B	Regular Intermediate Section (7015)	316-700-065
C	Intermediate Section w/Draw Rod Lugs (7016)	316-700-070
D	Back Section w/7" Flue, Supply & 2" Return (7017)	316-700-265
E	Section Replacement Kit (For 1 Joint, includes Seals, Rope, Adhesive and Collector Hood Hardware) Front or Back Section	386-700-852
	Section Replacement Kit (For 2 Joints, includes Seals, Rope and Adhesive) Intermediate Section	386-700-851
	Section Assembly Complete, For SGO-3 with jacket	386-700-665
	Section Assembly Complete, For SGO-4 with jacket	386-700-666
	Section Assembly Complete, For SGO-5 with jacket	386-700-667
	Section Assembly Complete, For SGO-6 with jacket	386-700-668
	Section Assembly Complete, For SGO-7 less jacket	386-700-669
	Section Assembly Complete, For SGO-8 less jacket	386-700-670
	Section Assembly Complete, For SGO-9 less jacket	386-700-671
F	Collector Hood Kit For SGO-3*	386-700-340
F	Collector Hood Kit For SGO-4*	386-700-341
F	Collector Hood Kit For SGO-5*	386-700-342
F	Collector Hood Kit For SGO-6*	386-700-343
F	Collector Hood Kit For SGO-7*	450-020-182
F	Collector Hood Kit For SGO-8*	450-020-184
F	Collector Hood Kit For SGO-9*	450-020-186
G	Tie Rod $^1/_2$ x 5$^1/_2$ (SGO-7, 8, 9)	560-234-464
G	Tie Rod $^1/_2$ x 10$^3/_4$ (SGO-7)	560-234-491
G	Tie Rod $^1/_2$ x 12$^1/_4$ (SGO-3)	560-234-493
G	Tie Rod $^1/_2$ x 13$^3/_8$ (SGO-7 & 8)	560-234-494
G	Tie Rod $^1/_2$ x 14 (SGO-8, 9)	560-234-470
G	Tie Rod $^1/_2$ x 15 (SGO-9)	560-234-495
G	Tie Rod $^1/_2$ x 15$^3/_8$ (SGO-4)	560-234-532
G	Tie Rod $^1/_2$ x 16$^1/_2$ (SGO-9)	560-234-496
G	Tie Rod $^1/_2$ x 18$^1/_2$ (SGO-5)	560-234-475
G	Tie Rod $^1/_2$ x 21$^5/_8$ (SGO-6)	560-234-536
G	Tie Rod $^1/_2$ x 24$^3/_4$ (SGO-7)	560-234-540
G	Tie Rod $^1/_2$ x 28 (SGO-8)	560-234-544
G	Tie Rod $^1/_2$ x 31 (SGO-9)	560-234-546
H	Heater Cover Plate Carton (Cover Plate, Gasket, Studs & Nuts)	389-900-103
J	Combustion Chamber Kit (Rear & Frt Ref., Door Refractory Blanket, Rope, Blanket & Water Glass)	385-700-355
	Burner Mounting Door Assembly (Door, Obs. Port, Rope, Ins. and Pins)	386-700-358
K	Burner Mounting Door (7070)	330-054-302
L	Door Hinge (7054)	330-054-300
M	Door Refractory	386-700-359
N	Door Refractory Blanket	591-222-115
P	Observation Port Shutter	460-039-867
Q	Door Seal Rope 5'	590-735-105
R	$^3/_8$" Glass Rope For Collector Hood (7' For Largest Size Hood)	590-739-109
S	Flue Cap Assembly (Cap, Strap, Rope and Screws)	386-700-344
	Flue Brush (123D)	591-706-214

* Includes flue cap assembly, rope and hardware for installation.


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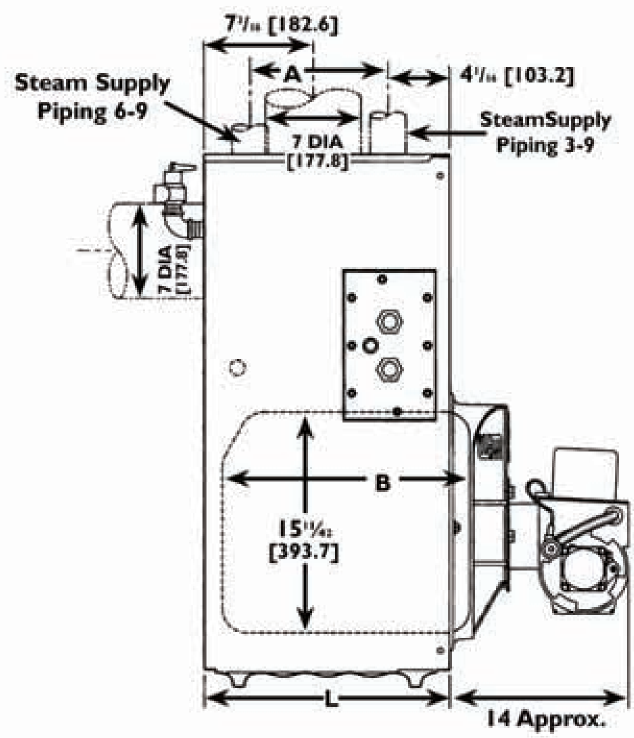
Dimensions

DIMENSIONS - in.			
BOILER MODEL NUMBER	A	B	L
SGO-3	—	13½	16⅞
SGO-4	—	16⅝	20
SGO-5	—	19⅞	22⅛
SGO-6	19	23½	26¼
SGO-7	22⅛	26⅛	29⅜
SGO-8	25¼	29¼	32½
SGO-9	28⅜	32⅜	35⅝

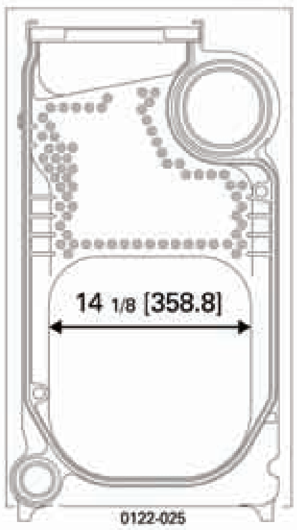


SGO "A" Front

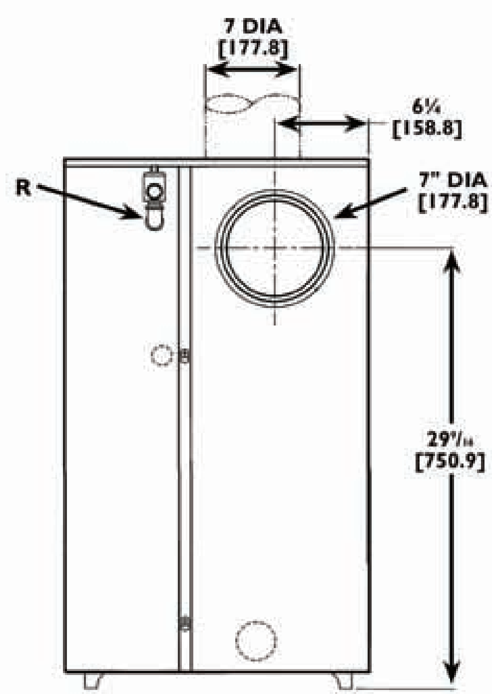
DIMENSIONS - mm.			
BOILER MODEL NUMBER	A	B	L
SGO-3	—	342.9	428.7
SGO-4	—	422.1	508.0
SGO-5	—	504.9	587.2
SGO-6	482.6	584.2	666.7
SGO-7	561.8	663.4	746.2
SGO-8	641.4	742.9	825.5
SGO-9	720.9	822.4	904.7



SGO Side with Burner



Intermediate



SGO Back

SGO GOLD OIL STEAM BOILER RATINGS (1)												
BOILER MODEL NUMBER	I=B=R BURNER CAPACITY GPH (3)	DOE HEATING CAPACITY (4) MBH (2)	NET I=B=R RATINGS (5)		DOE SEASONAL EFFICIENCY % AFUE	MINIMUM I=B=R CHIMNEY			ROUND FLUE OUTLET SIZE IN (7)	STEAM BOILER WATER CONTENT GAL (8)	DRAFT LOSS THRU BOILER IN W.C. (9)
			STEAM SQ.FT.	STEAM MBH		RECT IN	ROUND IN	HEIGHT FT			
*-SGO-3	0.95	114	354	85	83.8	8x8	6	15	7	10.7	.020
*-SGO-4	1.20	144	450	108	84.0	8x8	6	15	7	12.5	.010
*-SGO-5	1.45	174	546	131	83.9	8x8	7	15	7	14.2	.015
*-SGO-6	1.75	210	658	158	83.7	8x8	7	15	7	16	.015
**-SGO-7	2.00	240	750	180	83.6	8x8	8	15	7	17.7	.015
**-SGO-8	2.30	266 (6)	833	200	—	8x12	8	20	7	19.4	.025
**-SGO-9	2.55	295 (6)	921	221	—	8x12	8	20	7	21.2	.030

* Substitute "P" for completely assembled packaged steam boiler without burner (SGO-3 through SGO-6 only).
Substitute "A" for boiler only for use with approved burners as listed with I-B=R.

** Available only as an "A" unit.

(1) SGO boiler designed with convertible vertical and horizontal flue outlet.

(2) MBH refers to thousands of Btu per hour.

(3) Based on 140,000 Btu/gal.

(4) Based on standard test procedures prescribed by the United States Department of Energy at combustion condition of 13.0% CO_2 for SGO-3 and 13.5% for SGO-4 through 7

(5) Net I=B=R ratings are based on net installed radiation of sufficient quantity for the requirements of the building and nothing need be added for normal piping and pick-up. Steam ratings are based on a piping and pick-up allowance of 1.33. An additional allowance should be made for unusual piping and pick-up loads. Consult local Weil-McLain Sales Office.

(6) I=B=R gross output

(7) See page 12 for minimum breeching diameter.

(8) To water line.

(9) Listed draft losses are for factory-shipped settings.